

NASA Technical Paper 1549

Flight-Measured Afterbody Pressure
Coefficients From an Airplane
Having Twin Side-By-Side Jet Engines
for Mach Numbers From 0.6 to 1.6

Louis L. Steers

NOVEMBER 1979



NASA Technical Paper 1549

Flight-Measured Afterbody Pressure
Coefficients From an Airplane
Having Twin Side-By-Side Jet Engines
for Mach Numbers From 0.6 to 1.6

Louis L. Steers
Dryden Flight Research Center
Edwards, California



National Aeronautics
and Space Administration

**Scientific and Technical
Information Branch**

1979

FLIGHT-MEASURED AFTERBODY PRESSURE COEFFICIENTS
FROM AN AIRPLANE HAVING TWIN SIDE-BY-SIDE JET
ENGINES FOR MACH NUMBERS FROM 0.6 TO 1.6

Louis L. Steers
Dryden Flight Research Center

INTRODUCTION

Flight-measured performance has often differed significantly from that predicted from wind-tunnel tests of small-scale models (refs. 1 to 7). Many of the differences can be attributed to the general limitations of wind-tunnel testing, such as the difficulty in matching flight Reynolds numbers and the effects of tunnel wall reflections. Additional discrepancies are found in the wind-tunnel testing of afterbodies because of sting support requirements that change the geometry of the model afterbody, improper simulation of flow interference effects from adjacent stabilizing or control surfaces, and improper simulation of the effects of airframe-exhaust interactions, which are especially applicable to configurations with two side-by-side exhausts.

To help achieve a better understanding of the effects of scale, Reynolds number, jet exhaust, and wind-tunnel supports on the determination of full-scale flight afterbody performance based on wind-tunnel testing, afterbody pressures were obtained in the wind tunnel and in flight for the YF-17 aircraft, which has twin side-by-side jet engines. First, wind-tunnel tests were conducted on a 0.1-scale model to obtain comprehensive pressure data over the afterbody and nozzle regions, as described in Wind Tunnel Results From a Nozzle Afterbody Test of a 0.1-Scale Fighter Aircraft in the Mach Number Regime of 0.6 to 1.6, by Ernest J. Lucas (AEDC-TR-78-25, Arnold Engineering Dev. Center, Arnold AFS, Tenn., June 1978). For these tests, the model was supported alternately by a sting and by the wingtips so that the sting support effects could be defined. Exhaust flow effects were also simulated using unheated air. Later, similar tests were made using a 0.2-scale model, as described in Wind Tunnel Results From a Nozzle Afterbody Test of a 0.2-Scale Fighter Aircraft in the Mach Number Regime of 0.6 to 1.5, by Ernest J. Lucas (AEDC-TR-79-10, Arnold Engineering Dev. Center, Arnold AFS, Tenn., May 1979).

Following the 0.1-scale model tests, similar data were obtained on the full-scale YF-17 aircraft. The 3-month flight program was conducted by the U.S. Air Force, the U.S. Navy, the manufacturers of the airframe and engines, and the NASA Dryden Flight Research Center. Afterbody pressures were measured over the left boattail of the YF-17 fuselage and over the external surfaces of the left engine and exhaust nozzle. The data were obtained from 10 flights at Mach numbers ranging from 0.60 to 1.60 and altitudes from 2300 meters (7500 feet) to 15,200 meters (50,000 feet). The Reynolds number based on fuselage length ranged from approximately 0.60×10^8 to 2.60×10^8 .

This report presents the results of the flight program.

SYMBOLS

Physical quantities in this report are given in the International System of Units (SI) and parenthetically in U.S. Customary Units. The measurements were taken in Customary Units. Factors relating the two systems are presented in reference 8.

<i>AE L</i>	left nozzle exit area, cm^2 (in^2)
<i>AE R</i>	right nozzle exit area, cm^2 (in^2)
<i>ALPHA</i>	angle of attack, deg
<i>AN CG</i>	normal acceleration at the center of gravity, g
<i>BCL</i>	bottom centerline of vehicle
<i>BETA</i>	angle of sideslip, deg
<i>CP</i>	pressure coefficient, $\frac{PL - (PS/2)}{Q}$
<i>DA L</i>	deflection of left aileron, deg
<i>DEL P</i>	fuselage reference static pressure minus nose-boom reference static pressure, N/m^2 (lb/in^2)
<i>DH L</i>	deflection of left horizontal tail, deg
<i>DR L</i>	deflection of left rudder, deg
<i>DSB</i>	speed brake deflection, deg
<i>H</i>	pressure altitude, m (ft)
<i>L</i>	reference fuselage length, cm (in.)

<i>M</i>	Mach number
<i>NPR</i>	nozzle pressure ratio (calculated from manufacturer-supplied engine performance tables)
<i>PHI</i>	circumferential location measured clockwise from vertical (fig. 4), deg
<i>PL</i>	local pressure, N/m^2 (lb/in ²)
<i>PS 1</i>	free-stream static pressure, N/m^2 (lb/ft ²)
<i>PS 2</i>	static reference pressure, N/m^2 (lb/ft ²)
<i>Q</i>	dynamic pressure, N/m^2 (lb/ft ²)
<i>R</i>	Reynolds number based on fuselage length of 1804.87 cm (710.58 in.)
<i>RN</i>	unit Reynolds number, per m (per ft)
<i>TCL</i>	top centerline of vehicle
<i>W</i>	gross weight, kg (lb)
<i>X</i>	fuselage station, cm (in.)

DESCRIPTION OF YF-17 AIRPLANE AND TEST CONFIGURATION

The YF-17 airplane (fig. 1) is a lightweight fighter prototype with twin canted vertical tails located forward of the horizontal tail. The airplane incorporates an all-movable horizontal stabilizer, programed leading and trailing edge flaps, and conventional ailerons. A three-view drawing of the YF-17 airplane is shown in figure 2, and complete descriptions of the airplane and its physical characteristics are included in references 9 and 10.

The propulsion system consists of two side-by-side YJ101-GE-100 low-bypass-ratio turbojet engines with afterburners. The engines are installed in twin ducts having fixed geometry inlets and variable area exhaust nozzles. The iris-type exhaust nozzles have a plate and leaf arrangement that provides the proper nozzle area for nonafterburning and afterburning engine operation.

Boattail pressure coefficients were obtained for the left fuselage afterbody and nozzle (fig. 3, shaded area). There were 39 flush orifices distributed over the fuselage afterbody and 32 orifices on the outer surface of the nozzle. The locations of these orifices are shown in figure 4. All orifices were positioned on the airplane to match the selected orifice locations on the 0.1-scale wind-tunnel model as closely as structurally practical.

The orifice rows along the fuselage at several circumferential locations were located as far forward as was practical in order to define the upstream flow conditions. All pressure orifices were flush with the local surface, and the orifice edges were sharp and free of burrs.

There are several features of the full-scale airplane that complicate the problem of flow simulation on small-scale models. The features having the most significance are: the flush, screen-covered, engine bay purge exhausts, which are 11.43 centimeters (4.5 inches) by 27.94 centimeters (11 inches) and are located on the top and bottom centerlines of each engine bay (fig. 5); the compressor face bleed opening on the upper fuselage surface (fig. 5); and the oil drain and oil overflow protuberances on the lower fuselage surface. Table 1 lists the protuberances that existed on the full-scale vehicle near the pressure orifices. These protuberances were not simulated on the 0.1-scale and 0.2-scale models.

INSTRUMENTATION

Two 48-port multiplexing valves (Scanivalves), each having a differential pressure transducer, were installed in the engine bay and used to measure the pressures for the afterbody orifices. Static orifices on the airplane's nose boom were used as the reference pressure source for these transducers. The pressure source was monitored by a digital precision absolute pressure transducer contained in an environmentally controlled compartment. The pressure measurements for each Scanivalve were made in such a way that for at least one Scanivalve port, both sides of the transducer were exposed to the reference pressure. This procedure provided in-flight zero readings, which substantially reduced the uncertainty of the differential pressure measurements.

The total and static pressure measurements obtained from the nose boom, as described in references 11 and 12, were also used to calculate the free-stream Mach number.

The aircraft angle of attack measurements were taken from vanes located on the cheeks of the fuselage. The angles were calibrated through the digital air data computer (DADC). The angle of sideslip was obtained from a vane on the nose boom.

The positions of all the control surfaces (ailerons, horizontal stabilizers, speed brake, leading and trailing edge flaps, and rudder) were recorded with an onboard 10-bit pulse code modulation (PCM) system. Other parameters, such as nozzle exit area and gross weight, were also recorded on the PCM system, as were the values from the two Scanivalves which measured all the surface pressures.

DATA UNCERTAINTY

The pressure coefficients in this study are based on the equation

$$CP = \frac{PL - (PS/2)}{Q}$$

The estimated uncertainty values for the pressure coefficients were determined by the procedures given in references 13 and 14. In the following table, these uncertainty values are compared with the scatter observed in the experimental values.

M	H, m (ft)	Estimated ΔCP	ΔCP observed at AN CG = 1g	ΔCP observed at AN CG > 1g
0.60	7,800 (25,700)	± 0.024	± 0.005	-----
0.60	12,200 (40,000)	± 0.048	± 0.009	± 0.020
0.90	8,400 (27,400)	± 0.014	± 0.008	± 0.009
0.90	15,200 (50,000)	± 0.035	± 0.011	-----
1.20	7,600 (25,000)	± 0.006	± 0.002	-----

The calculations of the estimated uncertainties in the pressure coefficients accounted for the uncertainty in the static pressure position error and the pressure transducer uncertainty, including the effects of an estimated -6.6°C (20°F) uncertainty in the transducer environment temperature. As can be seen from the preceding table, the observed scatter bands are significantly smaller than the estimated band of uncertainty, which indicates good repeatability of the measurements.

Each pressure coefficient data point included in this study was based on the average of several Scanivalve cycles. This procedure reduces the scatter and is a factor in the observed scatter's being small as compared with the estimated uncertainty. Sufficient steady-state conditions were maintained during the data runs to minimize the effects of lag on the data.

Based on the averaging procedure, the application of in-flight zero corrections, and the careful avoidance of transient flight conditions, the estimated average uncertainty of the pressure coefficients based on the flight data is ± 0.01 for 1g flight conditions and ± 0.02 for the elevated g cases.

The manufacturer calibrated the pitot-static system using a combination of tower flyby, pacer, and radar tracking runs. According to the manufacturer's YF-17 Test Report (NOR 74-282, Northrop Corp., Jan. 1975), the maximum uncertainty in Mach number after correcting for position error occurs at a Mach number of 0.975 and is ± 0.035 .

With the YF-17 aircraft, angle of attack can be obtained by two methods. One method, the use of the nose-boom-mounted flight test vane, was not used in this study because of problems encountered in the measurements. The second method is to use the aircraft's angle of attack system. For this study, the measurements were corrected through the use of the DADC. The angle of attack accuracy was considered to be approximately $\pm 0.2^\circ$ for the range of angles of attack used for the present study (manufacturer's YF-17 Test Report, NOR 74-282).

FLIGHT CONDITIONS

For the subject tests, the Mach numbers ranged from 0.60 to 1.60 at altitudes from 2300 meters (7500 feet) to 15,200 meters (50,000 feet). Unit Reynolds number varied from 3.54×10^6 per meter (1.08×10^6 per foot) to 16.14×10^6 per meter (4.92×10^6 per foot), and the effective Reynolds number based on fuselage length varied from 0.57×10^8 to 2.58×10^8 .

Each test condition was stabilized and remained constant for approximately 1 minute prior to data acquisition. The automatic flap schedule, a mode for automatically setting flaps without pilot input, was kept in the inactive mode in order to limit the configuration variables.

The flight conditions flown to obtain the pressure coefficient data for the present study are listed in table 2. The combination of speed and altitude forms a matrix of constant Mach numbers and constant unit Reynolds numbers. This matrix of test conditions was flown to correspond to the conditions tested for the 0.1-scale and 0.2-scale wind-tunnel models.

PRESENTATION OF THE DATA

The afterbody pressure coefficients derived from the pressure measurements for the flight conditions in table 2 are listed in table 3 in a form convenient for comparison with wind-tunnel data. The flight conditions, such as Mach number, dynamic pressure, and control surface positions, are also identified in the table. Selected data from this table are presented in the next section for a general discussion of parameter effects on the pressure coefficient.

RESULTS AND DISCUSSION

A typical time history for three pressure orifices located at $X/L = 0.99$ is presented in figure 6. The figure shows that the maximum deviations of the pressure coefficient data from the average values (solid lines) are well within the uncertainty bands (dashed lines). This result validates the steadiness of the flight data runs and helps to verify the quoted accuracy.

Flight pressure coefficients obtained from four representative circumferential locations at three Mach number conditions are shown in figure 7. At all three Mach numbers presented, the flow over the afterbody tends to expand as the boattail angle increases, then recompresses over the nozzle because of the high pressure region at the nozzle exit. However, because the orifice row at $\phi = 0^\circ$ is in the positive pressure field of the vertical tail from $X/L = 0.84$ to $X/L = 0.94$, the general trend does not hold. In this region the flow is in compression, but after passing the vertical tail trailing edge the flow follows the same trend as the flow at the other orifice rows.

The data presented in figure 8 show the effect of angle of attack for the three representative Mach numbers. The data indicate that for small angles of attack (below approximately 5°) the influence of the aircraft's attitude on the flow over the afterbody region is minimal throughout the Mach number range of this study, although the influence of the vertical tail is again evident for the flow at $\phi = 0^\circ$.

The effects of variations in NPR are shown in figure 9. For the nonafterburning operating condition ($AE L = 1484 \text{ cm}^2 (230 \text{ in}^2)$) shown in figures 9(a) and 9(b), the pressure coefficient is more positive than for the afterburning operating condition shown in figure 9(c). Generally speaking, the increased NPR appears to affect only the nozzle region.

Reynolds number variations within each Mach number presented in figure 10 show that the pressure coefficients fall within their repeatability bands. No direct Reynolds number effect is indicated by this figure.

The afterbody pressure data presented in figures 7 to 10 show the effects of some flight dependent parameters for a few of the test conditions given in table 2. The data from the present study (table 3), along with the data from the wind-tunnel tests of the 0.1-scale and 0.2-scale models, add to the data bank for evaluating nozzle afterbody wind-tunnel test techniques.

*Dryden Flight Research Center
National Aeronautics and Space Administration
Edwards, Calif., May 29, 1979*

REFERENCES

1. Pyle, Jon S.; and Saltzman, Edwin J.: Review of Drag Measurements From Flight Tests of Manned Aircraft With Comparisons to Wind-Tunnel Predictions. AGARD Conference on Aerodynamic Drag. Aerodynamic Drag, AGARD-CP-124, Oct. 1973, pp. 25-1 to 25-12.
2. Saltzman, Edwin J.; and Bellman, Donald R.: A Comparison of Some Aerodynamic Drag Factors as Determined in Full-Scale Flight With Wind-Tunnel and Theoretical Results. Facilities and Techniques for Aerodynamic Testing at Transonic Speeds and High Reynolds Number, AGARD-CP-83-71, Aug. 1971, pp. 16-1 to 16-9.
3. McDonald, H.; and Hughes, P. F.: A Correlation of High Subsonic Afterbody Drag in the Presence of a Propulsive Jet or Support Sting. J. Aircraft, vol. 2, no. 3, May-June 1965, pp. 202-207.
4. Reubush, David E.: The Effect of Reynolds Number on Boattail Drag. AIAA Paper 75-63, Jan. 1975.
5. Lee, Kenneth W.; and Franz, Joseph J.: Aftend Drag Data Correlation and Prediction Technique for Twin Jet Fighter Type Aircraft. AIAA Paper 76-672, July 1976.
6. Chamberlin, Roger; and Blaha, Bernard J.: Flight and Wind Tunnel Investigation of the Effects of Reynolds Number on Installed Boattail Drag at Subsonic Speeds. AIAA Paper 73-139, Jan. 1973.
7. Rooney, E. C.; Craig, R. E.; and Lauer, R. F.: Correlation of Full Scale Wind Tunnel and Flight Measured Aerodynamic Drag. AIAA Paper 77-996, July 1977.
8. Mechty, E. A.: The International System of Units—Physical Constants and Conversion Factors. Second Revision. NASA SP-7012, 1973.
9. Sisk, Thomas R.: A Preliminary Assessment of the Transonic Maneuvering Characteristics of Two Advanced Technology Fighter Aircraft. NASA TM X-3439, 1976.
10. Friend, Edward L.; and Matheny, Neil W.: Preliminary Flight Measurements of the Buffet Characteristics of Prototype Lightweight Fighter Aircraft. NASA TM X-3549, 1977.
11. Olson, Wayne M.; Wood, Richard A.; and Clarke, Michael J.: YF-17 Performance and Flying Qualities Evaluation. AFFTC-TR-75-18, Air Force Flight Test Center, Edwards AFB, Calif., June 1975.
12. Sakamoto, Glenn M.: Aerodynamic Characteristics of a Vane Flow Angularity Sensor System Capable of Measuring Flightpath Accelerations for the Mach Number Range From 0.40 to 2.54. NASA TN D-8242, 1976.

13. Goecke, Sheryll A.: Flight-Measured Base Pressure Coefficients for Thick Boundary-Layer Flow Over an Aft-Facing Step for Mach Numbers From 0.4 to 2.5. NASA TN D-7202, 1973.
14. Beers, Yardley: Introduction to the Theory of Error. Second ed., Addison-Wesley Publishing Co., Inc., 1962.

TABLE 1.—LOCATION OF SURFACE PRESSURE ORIFICES
RELATIVE TO POTENTIAL INTERFERENCE SOURCES AND PROTUBERANCES

Orifice location relative to aircraft		Orifice location relative to interference source protuberance
X/L	ϕ , deg	
0.84	0	25 cm (10 in.) aft of bleed door
0.90	↓	18 cm (7 in.) aft of access plate
0.94	↓	8 cm (3 in.) ahead of bay purge bleed
0.83	180	13 cm (5 in.) ahead of oil drain
0.88	↓	18 cm (7 in.) aft of two oil drains
0.93	↓	15 cm (6 in.) ahead of access panel
0.86	225	Halfway between two sets of four screws each
0.88	↓	5 cm (2 in.) aft of and 3 cm (1 in.) above discontinuity
0.96	↓	Behind horizontal stabilizer
0.88	↓	Behind horizontal stabilizer
0.91	315	15 cm (6 in.) aft of trailing edge of rudder
0.93	*	15 cm (6 in.) aft of gap
0.96	*	In valley between engines

*Located at top centerline of vehicle (TCL).

TABLE 2.—FLIGHT TEST CONDITIONS

AN CG, g	M	H, m (ft)	ALPHA, deg
1 ↓	0.620	2,460 (8,070)	1.1
	0.610	2,470 (8,090)	2.1
	0.610	7,590 (24,900)	3.4*
	0.610	7,620 (25,000)	3.6
	0.600	10,120 (33,200)	6.0
	0.640	12,300 (40,400)	6.4
	0.640	12,300 (40,400)	6.5
	0.640	12,300 (40,400)	6.5*
	0.640	12,130 (39,800)	7.0
	0.610	12,150 (39,900)	8.0
	0.600	12,090 (39,700)	8.8
	0.820	3,000 (9,700)	1.1
	0.810	6,000 (19,800)	1.5
	0.900	3,200 (10,500)	0.9
	0.910	5,530 (18,100)	0.9
	0.900	8,530 (28,000)	1.4
	0.900	8,390 (27,500)	1.4*
	0.930	12,780 (41,900)	2.6
	0.900	12,860 (42,100)	2.7*
	0.910	15,260 (50,100)	3.6
	0.890	15,190 (49,800)	4.0
	1.190	7,510 (24,600)	0.7
	1.180	7,910 (25,900)	0.8
	1.170	9,280 (30,500)	1.5
	1.170	12,000 (39,300)	2.1
	1.250	15,210 (49,900)	2.9
	1.590	10,990 (36,100)	0.8
	1.470	12,160 (39,900)	1.3*
	1.580	12,750 (41,800)	1.4

*Flight test points that correlate most closely with wind-tunnel conditions.

TABLE 2.—Concluded

<i>AN CG,</i> g	<i>M</i>	<i>H, m (ft)</i>	<i>ALPHA,</i> deg
1.2	0.900	14,840 (48,700)	4.0
↓	0.960	14,980 (49,100)	4.4
	0.960	15,160 (49,700)	4.5
↓	1.240	14,910 (48,900)	0
	1.240	15,140 (49,700)	3.1*
1.3	0.890	15,150 (49,700)	5.8*
2	0.600	3,030 (10,000)	2.4
↓	0.620	2,970 (9,700)	3.1*
	0.630	5,400 (17,700)	4.2
	0.600	5,240 (17,200)	5.4
	0.620	7,630 (25,000)	6.5*
	0.910	4,070 (13,400)	1.4*
	0.930	8,230 (27,000)	2.4
	0.880	8,340 (27,800)	2.6*
	0.870	8,510 (27,900)	2.6
	0.950	12,870 (42,200)	4.8
	1.200	7,860 (25,800)	2.1*
	1.180	8,160 (26,800)	2.1
↓	1.190	12,230 (40,100)	3.0*
	1.180	12,520 (41,100)	3.9*
4	0.628	2,380 (7,800)	4.9
↓	0.621	2,460 (8,100)	5.7
	0.590	2,640 (8,700)	6.2*
	0.920	3,210 (10,500)	2.1
	0.920	3,940 (12,900)	2.5*
	0.880	7,690 (25,200)	4.5*
↓	1.150	6,940 (22,800)	3.0*

*Flight test points that correlate most closely with wind-tunnel conditions.

TABLE 3.—Continued

M = .607	AN CG = .33	AE L = 204			
C = 403.5	M = 20189	AE R = 204			
ALPHA = 2.12	DA L = 1.04	PS 1 = 1579.0			
BETA = -.51	OH L = -.54	PS 2 = 1579.0			
NFR = 1.98	DR L = -.14	M = 8089			
RN (10) = 3.57	OSR = -.32	DEL P = -.06			
PHI	X	CP	PHI	X	CP
0.0	596.00	-.185	247.5	685.00	-.140
0.0	620.00	-.133	252.5	685.00	-.128
0.0	637.00	-.075	282.0	685.00	-.121
0.0	665.00	-.040	292.5	685.00	-.103
0.0	675.00	-.158	315.0	644.35	-.043
0.0	685.00	-.181	315.0	658.00	-.085
0.0	687.00	-.186	315.0	670.25	-.089
0.0	693.00	-.202	315.0	685.00	-.132
0.0	700.00	.002	320.0	687.30	-.162
0.0	706.00	.108	315.0	693.00	-.116
22.5	693.00	-.150	315.0	695.00	-.048
22.5	700.00	.019	315.0	703.00	.026
45.0	693.00	-.034	315.0	702.00	.089
45.0	700.00	.017	315.0	706.00	.120
50.0	685.00	.028	TCL	658.70	-.027
50.0	687.30	-.129	TCL	685.00	-.082
50.0	687.30	-.166	ECL	586.00	-.370
77.0	685.00	.051	ECL	646.00	-.069
90.0	693.00	.060	ECL	671.00	-.041
90.0	706.00	.020			
135.0	685.00	-.067			
135.0	687.30	-.069			
135.0	693.00	-.013			
135.0	695.00	.026			
135.0	700.00	.035			
135.0	702.00	.040			
135.0	706.00	.046			

TABLE 3.—Continued

M = .613	AN CG = .91	AE L = 204
C = 207.2	W = 20575	AE R = 204
ALPHA = 3.38	DB L = 14.16	PS 1 = 794.7
BETA = -.62	DH L = -.17	PS 2 = 791.9
NFR = 1.99	DR L = -.01	H = 24914
-6	DSB = -.33	DEL P = -.00
RN (10) = 2.08		

PHI	X	CP	PHI	X	CP	PHI	X	CP
596.00	-.211	157.5	693.00	-.109	247.5	685.00	-.140	
620.00	-.150	157.5	700.00	.014	252.5	685.00	-.128	
637.00	-.087	180.0	590.15	-.045	282.0	685.00	-.128	
665.00	-.039	180.0	625.35	-.043	292.5	685.00	-.102	
675.00	-.157	180.0	661.60	-.037	315.0	644.35	-.048	
685.00	-.177	180.0	685.00	-.147	315.0	658.00	-.085	
687.00	-.185	180.0	687.30	-.143	315.0	670.25	-.089	
693.00	-.187	180.0	693.00	-.131	315.0	685.00	-.126	
700.00	.012	181.0	694.00	-.110	320.0	687.30	-.153	
706.00	.109	180.0	700.00	.019	315.0	693.00	-.099	
693.00	-.143	180.0	706.00	.108	315.0	695.00	-.032	
700.00	.021	202.5	693.00	-.149	315.0	700.00	.044	
693.00	-.028	215.0	685.00	-.135	315.0	702.00	.096	
700.00	.013	215.0	687.30	-.167	315.0	706.00	.121	
706.00	.028	225.0	520.00	-.030	TCL	658.70	-.012	
685.00	-.119	225.0	571.00	-.034	TCL	685.00	-.080	
687.30	-.152	225.0	611.00	-.005	ECL	586.00	-.065	
685.00	.045	225.0	624.50	-.036	ECL	646.00	-.072	
693.00	.057	225.0	643.00	-.062	ECL	671.00	-.042	
706.00	.024	225.0	667.00	-.052				
685.00	-.076	225.0	693.00	-.141				
687.30	-.077	225.0	695.00	-.059				
693.00	-.014	225.0	700.00	.037				
695.00	.024	225.0	702.00	.085				
700.00	.031	225.0	706.00	.105				
702.00	.043							
706.00	.050							

TABLE 3.—Continued

M = .605	AN CG = .94	AE L = 204			
Q = 201.3	W = 21866	AE R = 204			
ALPHA = 3.61	DA L = 4.53	PS 1 = 791.2			
BETA = -.24	OH L = -1.10	PS 2 = 788.0			
NPR = 1.84	OR L = .08	H = 25008			
-6	DSB = -3.19	DEL P = -.00			
RN (10) = 2.06					
PHI	X	CP	PHI	X	CP
0.0	596.00	-.207	247.5	685.00	-.147
0.0	620.00	-.161	252.5	685.00	-.137
0.0	637.00	-.098	282.0	685.00	-.139
0.0	665.00	-.046	292.5	685.00	-.112
0.0	675.00	-.166	315.0	644.35	-.054
0.0	685.00	-.186	315.0	658.00	-.092
0.0	687.00	-.194	315.0	670.25	-.096
0.0	693.00	-.189	315.0	685.00	-.133
0.0	700.00	.012	320.0	687.30	-.159
0.0	706.00	.109	315.0	693.00	-.110
22.5	693.00	-.143	315.0	695.00	-.031
22.5	700.00	.020	315.0	700.00	.045
45.0	693.00	-.033	315.0	702.00	.090
45.0	700.00	.013	315.0	706.00	.120
45.0	706.00	.029	TCL	658.70	-.020
50.0	685.00	-.130	TCL	685.00	-.089
50.0	687.30	-.161	BCL	586.00	-.072
77.0	685.00	.036	BCL	646.00	-.078
90.0	693.00	.056	BCL	671.00	-.051
90.0	706.00	.021			
135.0	685.00	-.082			
135.0	687.30	-.083			
135.0	693.00	-.015			
135.0	695.00	.022			
135.0	700.00	.029			
135.0	702.00	.039			
135.0	706.00	.047			

TABLE 3.—Continued

PHI	X	CP	PHI	X	CP	PHI	X	CP	PHI	X	CP
0.0	596.00	-.221	157.5	693.00	-.122	247.5	685.00	-.148			
0.0	620.00	-.176	157.5	700.00	.015	252.5	685.00	-.133			
0.0	637.00	-.115	180.0	590.15	-.047	282.0	685.00	-.131			
0.0	665.00	-.045	180.0	625.35	-.045	292.5	695.00	-.099			
0.0	675.00	-.169	180.0	661.60	-.043	315.0	644.35	-.067			
0.0	695.00	-.166	180.0	685.00	-.158	315.0	650.00	-.099			
0.0	697.00	-.167	180.0	687.30	-.247	315.0	670.25	-.095			
0.0	693.00	-.145	180.0	693.00	-.124	315.0	685.00	-.121			
0.0	700.00	.032	181.0	694.00	-.095	320.0	687.30	-.142			
0.0	706.00	.110	180.0	700.00	.036	315.0	693.00	-.072			
22.5	693.00	-.131	180.0	706.00	.106	315.0	695.00	-.009			
22.5	700.00	.015	202.5	693.00	-.136	315.0	700.00	.058			
45.0	693.00	-.039	215.0	685.00	-.140	315.0	702.00	.106			
45.0	700.00	.078	215.0	687.30	-.164	315.0	706.00	.133			
45.0	706.00	.031	225.0	620.00	-.007	TCL	658.70	-.027			
50.0	695.00	-.124	225.0	571.00	-.032	TCL	685.00	-.095			
50.0	687.30	-.153	225.0	611.00	.076	BCL	586.00	-.067			
77.0	685.00	.016	225.0	624.50	-.032	BCL	646.00	-.081			
90.0	693.00	.039	225.0	643.00	-.067	BCL	671.00	-.056			
90.0	706.00	-.110	225.0	667.00	-.056						
135.0	685.00	-.099	225.0	693.00	-.106						
135.0	697.30	-.099	225.0	695.00	-.018						
135.0	693.00	-.032	225.0	700.00	.056						
135.0	695.00	-.110	225.0	702.00	.102						
135.0	700.00	.027	225.0	706.00	.115						
135.0	702.00	.043									
135.0	706.00	.054									

-6

M = .652 AN CG = .96 AE L = 205

Q = 114.8 W = 20781 AE R = 205

ALPHA = 5.37 DA L = 16.87 PS 1 = 388.4

BETA = -.79 DM L = -1.45 PS 2 = 384.8

NPR = 3.76 DR L = .04 W = 40365

RN (10) = 1.23 DSB = -.28 DEL P = .03

TABLE 3.—Continued

M = .604	AN CG = 1.03	AE L = 204
Q = 138.4	W = 22595	AE R = 205
ALPHA = 5.98	DA L = 3.85	PS 1 = 546.5
BETA = -.71	DH L = -1.31	PS 2 = 542.3
NPR = 2.69	OR L = -.02	H = 33197
RN (10) = 1.52	DSB = -3.29	DEL P = .02

PHI	X	CP	PHI	X	CP
0.0	596.00	-.218	247.5	685.00	-.148
0.0	620.00	-.169	252.5	685.00	-.137
0.0	637.00	-.110	282.0	685.00	-.137
0.0	665.00	-.045	292.5	685.00	-.165
0.0	675.00	-.173	315.0	644.35	-.062
0.0	685.00	-.174	315.0	658.00	-.099
0.0	687.00	-.178	315.0	670.25	-.098
0.0	693.00	-.156	315.0	685.00	-.130
0.0	700.00	-.025	320.0	687.30	-.148
0.0	706.00	-.101	315.0	693.00	-.084
22.5	693.00	-.132	315.0	695.00	-.022
22.5	700.00	-.018	315.0	700.00	.052
45.0	693.00	-.034	315.0	702.00	.103
45.0	700.00	.008	315.0	706.00	.119
45.0	706.00	.025	TCL	658.70	-.030
50.0	687.30	-.126	TCL	685.00	-.097
50.0	685.00	-.153	BCL	586.00	.011
77.0	685.00	.023	BCL	646.00	-.074
90.0	693.00	.048	BCL	671.00	-.055
90.0	706.00	.014			
135.0	685.00	-.100			
135.0	687.30	-.103			
135.0	693.00	-.026			
135.0	695.00	.018			
135.0	700.00	.027			
135.0	702.00	.040			
135.0	706.00	.045			

TABLE 3.—Continued

M = .540	AN CG = .91	AE L = 205			
n = 110.3	M = 20798	AE R = 205			
ALPHA = 6.43	DA L = 16.98	PS 1 = 388.5			
BETA = -.81	OH L = -1.70	PS 2 = 385.2			
NPR = 3.65	DR L = -.02	M = 40351			
DN (10) = 1.20	OSR = -.28	DEL P = .03			
PHI	X	CP	PHI	X	CP
0.0	596.00	-.213	247.5	685.00	-.149
0.0	620.00	-.170	252.5	685.00	-.136
0.0	637.00	-.112	282.0	685.00	-.130
0.0	665.00	-.048	292.5	685.00	-.102
0.0	675.00	-.170	315.0	644.35	-.067
0.0	695.00	-.164	315.0	658.00	-.099
0.0	687.00	-.168	315.0	670.25	-.095
0.0	693.00	-.143	315.0	685.00	-.121
0.0	700.00	.027	320.0	687.30	-.138
0.0	706.00	.102	315.0	693.00	-.077
22.5	693.00	-.132	315.0	695.00	-.014
22.5	700.00	.012	315.0	700.00	.057
45.0	693.00	-.040	315.0	702.00	.103
45.0	700.00	.005	315.0	706.00	.128
45.0	706.00	.023	TCL	658.70	-.025
50.0	695.00	-.127	TCL	685.00	-.093
50.0	687.30	-.151	8CL	586.00	-.065
77.0	685.00	.016	8CL	646.00	-.082
90.0	693.00	.036	8CL	671.00	-.059
90.0	706.00	.008			
135.0	685.00	-.102			
135.0	687.30	-.100			
135.0	693.00	-.038			
135.0	695.00	.005			
135.0	700.00	.025			
135.0	702.00	.042			
135.0	706.00	.053			

TABLE 3.—Continued

M = .636	AN CG = .95	AE L = 205			
Q = 111.9	W = 22601	AE R = 205			
ALPHA = 6.96	DA L = 4.45	PS 1 = 399.1			
BETA = -.18	DH L = -1.44	PS 2 = 395.3			
NPR = 3.24	DR L = .70	W = 39793			
-6	DSR = -3.11	DEL P = .04			
RN (10) = 1.22					
PHI	X	CP	PHI	X	CP
0.0	596.00	-.223	247.5	685.00	-.138
0.0	620.00	-.179	252.5	685.00	-.129
0.0	637.00	-.112	282.0	685.00	-.128
0.0	665.00	-.045	292.5	685.00	-.099
0.0	675.00	-.173	315.0	644.35	-.063
0.0	685.00	-.162	315.0	658.00	-.098
0.0	687.00	-.166	315.0	670.25	-.094
0.0	693.00	-.136	315.0	685.00	-.114
0.0	700.00	.030	320.0	687.30	-.134
0.0	706.00	.100	315.0	693.00	-.071
22.5	693.00	-.119	315.0	695.00	-.011
22.5	700.00	.019	315.0	700.00	.057
45.0	693.00	-.025	315.0	702.00	.113
45.0	700.00	.013	315.0	706.00	.121
45.0	706.00	.027	TCL	658.70	-.016
50.0	685.00	-.118	TCL	685.00	-.091
50.0	687.30	-.138	BCL	586.00	-.055
77.0	685.00	.024	BCL	646.00	-.072
90.0	693.00	.044	BCL	671.00	-.054
90.0	706.00	.014			
135.0	685.00	-.094			
135.0	687.30	-.094			
135.0	693.00	-.030			
135.0	695.00	.015			
135.0	700.00	.033			
135.0	702.00	.047			
135.0	706.00	.057			

TABLE 3. --Continued

M = .605	AN CG = .93	AE L = 205			
Q = 100.9	W = 22746	AE R = 203			
ALPHA = 8.00	DA L = 4.00	PS 1 = 397.3			
BETA = -.57	OH L = -1.67	PS 2 = 393.5			
NPR = 2.95	DR L = .41	H = 39868			
-6	OSB = -3.11	DEL P = .03			
RN (10) = 1.16					
PHI	X	CP	PHI	X	CP
0.0	596.00	-.229	157.5	693.00	-.126
0.0	620.00	-.179	157.5	700.00	-.007
0.0	637.00	-.116	180.0	690.15	-.048
0.0	665.00	-.046	180.0	625.35	-.036
0.0	675.00	-.174	180.0	661.60	-.030
0.0	685.00	-.166	180.0	685.00	-.156
0.0	687.00	-.172	180.0	687.30	-.174
0.0	693.00	-.138	180.0	693.00	-.130
0.0	700.00	.025	181.0	694.00	-.102
0.0	706.00	.095	180.0	700.00	.027
22.5	693.00	-.120	180.0	706.00	.091
22.5	700.00	.015	202.5	693.00	-.138
45.0	693.00	-.028	215.0	685.00	-.140
45.0	700.00	.011	215.0	687.30	-.164
45.0	706.00	.021	225.0	620.00	.006
50.0	685.00	-.118	225.0	571.00	-.024
50.0	687.30	-.144	225.0	611.00	.008
77.0	685.00	.017	225.0	624.50	-.014
90.0	693.00	.039	225.0	643.00	-.046
90.0	706.00	.011	225.0	667.00	-.046
135.0	685.00	-.105	225.0	693.00	-.116
135.0	687.30	-.107	225.0	695.00	-.028
135.0	693.00	-.036	225.0	700.00	.051
135.0	695.00	.017	225.0	702.00	.091
135.0	700.00	.029	225.0	706.00	.103
135.0	702.00	.039			
135.0	706.00	.045			
			247.5	685.00	-.144
			252.5	685.00	-.138
			282.0	685.00	-.138
			292.5	685.00	-.105
			315.0	644.35	-.067
			315.0	658.00	-.097
			315.0	670.25	-.093
			315.0	685.00	-.122
			320.0	687.30	-.138
			315.0	693.00	-.072
			315.0	695.00	-.016
			315.0	700.00	.051
			315.0	702.00	.101
			315.0	706.00	.115
			TCL	658.70	-.022
			TCL	685.00	-.093
			BCL	586.00	-.055
			BCL	646.00	-.075
			BCL	671.00	-.057

TABLE 3.—Continued

M = .823	AN CS = 1.03	AE L = 205			
Q = 698.8	W = 23665	AE R = 206			
ALPHA = 1.03	DA L = .77	PS 1 = 1496.0			
BETA = -.30	DH L = -.73	PS 2 = 1495.5			
NPR = 3.05	DR L = .35	H = 9666			
RN (10 ⁻⁶) = 4.57	DSB = -.28	DEL P = -.14			
PHI	X	CP	PHI	X	CP
0.0	596.00	-.240	247.5	685.00	-.155
0.0	620.00	-.179	252.5	685.00	-.141
0.0	637.00	-.095	282.0	685.00	-.125
0.0	665.00	-.049	292.5	685.00	-.111
0.0	675.00	-.184	315.0	644.35	-.052
0.0	685.00	-.192	315.0	658.00	-.105
0.0	697.00	-.187	315.0	670.25	-.113
0.0	693.00	-.197	315.0	685.00	-.146
0.0	700.00	.016	320.0	687.30	-.168
0.0	706.00	.124	315.0	693.00	-.107
22.5	693.00	-.131	315.0	695.00	-.034
22.5	700.00	.034	315.0	700.00	.039
45.0	693.00	-.017	315.0	702.00	.108
45.0	700.00	.022	315.0	706.00	.126
45.0	706.00	.031	TCL	658.70	-.018
50.0	685.00	-.132	TCL	685.00	-.092
50.0	687.30	-.156	BCL	586.00	-.085
77.0	685.00	.049	BCL	646.00	-.087
90.0	693.00	.065	BCL	671.00	-.047
90.0	706.00	.026			
135.0	685.00	-.049			
135.0	687.30	-.046			
135.0	693.00	.010			
135.0	695.00	.030			
135.0	700.00	.032			
135.0	702.00	.036			
135.0	706.00	.041			

TABLE 3.—Continued

M = .809	AN CG = .97	AE L = 205			
Q = 450.5	W = 23242	AE R = 205			
ALPHA = 1.45	OA L = .64	PS 1 = 996.2			
BETA = -.31	OH L = -.61	PS 2 = 994.0			
NPR = 2.55	OR L = .66	H = 19762			
RN (10) = 3.24	OS9 = -.32	DEL P = -.06			
PHI	X	CP	PHI	X	CP
0.0	596.00	-.241	247.5	685.00	-.159
0.0	620.00	-.199	252.5	685.00	-.146
0.0	637.00	-.109	282.0	685.00	-.132
0.0	665.00	-.052	292.5	685.00	-.115
0.0	675.00	-.187	315.0	644.35	-.058
0.0	685.00	-.196	315.0	658.00	-.109
0.0	687.00	-.196	315.0	670.25	-.116
0.0	693.00	-.191	315.0	685.00	-.148
0.0	700.00	.017	320.0	687.30	-.172
0.0	706.00	.108	315.0	693.00	-.103
22.5	693.00	-.125	315.0	695.00	-.042
22.5	700.00	.023	315.0	700.00	.095
45.0	693.00	-.021	315.0	702.00	.112
45.0	700.00	.013	TCL	658.70	-.013
45.0	706.00	.024	TCL	685.00	-.094
50.0	685.00	-.125	BCL	586.00	-.088
50.0	687.30	-.149	BCL	646.00	-.090
77.0	685.00	.040	BCL	671.00	-.052
90.0	693.00	.058			
90.0	706.00	.016			
135.0	685.00	-.056			
135.0	687.30	-.055			
135.0	693.00	.004			
135.0	695.00	.020			
135.0	700.00	.025			
135.0	702.00	.031			
135.0	706.00	.035			

M = .900	AN CG = .95	AE L = 205
Q = 809.5	W = 234.86	AE R = 205
ALPHA = .85	TA L = .93	PS 1 = 1454.9
BETA = -.35	DH L = -.92	PS 2 = 1455.5
NPR = 3.06	DR L = -.96	H = 10495
$\frac{-6}{RN(10)} = 4.84$	DSB = -.26	DEL P = -.17

PHI	X	CP	PHI	X	CP	PHI	X	CP
0.0	596.00	-.300	157.5	693.00	-.054	247.5	685.00	-.165
0.0	620.00	-.270	157.5	700.00	.040	252.5	685.00	-.147
0.0	637.00	-.082	180.0	590.15	-.068	282.0	685.00	-.123
0.0	665.00	-.039	180.0	625.35	-.055	292.5	685.00	-.112
0.0	675.00	-.188	180.0	661.60	-.061	315.0	644.35	-.037
0.0	685.00	-.195	180.0	685.00	-.139	315.0	658.00	-.099
0.0	687.00	-.183	180.0	687.30	-.142	315.0	670.25	-.114
0.0	693.00	-.194	180.0	693.00	-.100	315.0	685.00	-.148
0.0	700.00	.031	181.0	694.00	-.065	320.0	687.30	-.167
0.0	706.00	.135	180.0	700.00	.045	315.0	693.00	-.102
22.5	693.00	-.112	180.0	706.00	.126	315.0	695.00	-.058
22.5	700.00	.052	202.5	693.00	-.136	315.0	700.00	.058
45.0	693.00	-.002	215.0	685.00	-.160	315.0	702.00	.120
45.0	700.00	.036	215.0	687.30	-.186	315.0	706.00	.144
45.0	706.00	.040	225.0	520.00	-.102	TCL	658.70	.003
50.0	685.00	-.123	225.0	571.00	-.055	TCL	685.00	-.078
50.0	687.30	-.144	225.0	611.00	-.007	BCL	586.00	-.082
77.0	685.00	.065	225.0	624.50	-.044	BCL	646.00	-.087
90.0	693.00	.080	225.0	643.00	-.100	BCL	671.00	-.041
90.0	706.00	.034	225.0	667.00	-.094			
135.0	685.00	-.024	225.0	693.00	-.145			
135.0	687.30	-.017	225.0	695.00	-.037			
135.0	693.00	.041	225.0	700.00	-.060			
135.0	695.00	.045	225.0	702.00	.122			
135.0	700.00	.044	225.0	706.00	.156			
135.0	702.00	.044						
135.0	706.00	.043						

TABLE 3.—Continued

M = .908	AN CG = .95	AE L = 205			
Q = 606.7	W = 20335	AE R = 205			
ALPHA = .94	OA L = 15.35	PS 1 = 1071.5			
EETA = -.40	OH L = -.88	PS 2 = 1071.1			
NFR = 3.32	OP L = -.15	H = 18138			
-6	DSB = -.32	DEL P = -.10			
RN (10) = 3.81					
PHI	X	CP	PHI	X	CP
0.0	596.00	-.320	157.5	693.00	-.050
0.0	620.00	-.310	157.5	700.00	.046
0.0	637.00	-.077	180.0	590.15	-.066
0.0	665.00	-.038	180.0	625.35	-.055
0.0	675.00	-.175	180.0	661.60	-.062
0.0	685.00	-.192	180.0	685.00	-.138
0.0	687.00	-.183	180.0	687.30	-.419
0.0	693.00	-.185	180.0	693.00	-.094
0.0	700.00	.045	181.0	694.00	-.060
0.0	706.00	.142	180.0	700.00	.053
22.5	693.00	-.099	180.0	706.00	.134
22.5	700.00	.057	202.5	693.00	-.133
45.0	693.00	.007	215.0	685.00	-.164
45.0	700.00	.041	215.0	687.30	-.186
45.0	706.00	.041	225.0	520.00	-.104
50.0	685.00	-.114	225.0	571.00	-.059
50.0	687.30	-.134	225.0	611.00	-.002
77.0	685.00	.068	225.0	624.50	-.042
90.0	693.00	.083	225.0	643.00	-.098
90.0	706.00	.037	225.0	667.00	-.094
135.0	685.00	-.014	225.0	693.00	-.134
135.0	687.30	-.019	225.0	695.00	-.023
135.0	693.00	.051	225.0	700.00	.074
135.0	695.00	.050	225.0	702.00	.132
135.0	700.00	.048	225.0	706.00	.161
135.0	702.00	.046			
135.0	706.00	.044			

TABLE 3.—Continued

M = .902	AN CG = .93	AE L = 205
Q = 391.9	W = 22885	AE R = 205
ALPHA = 1.43	OA L = .61	PS 1 = 701.1
BETA = -.57	OH L = -.94	PS 2 = 698.3
NFR = 3.14	DR L = .12	W = 27997
-6	CSB = -.29	DEL P = -.03
RN (10) = 2.59		

PHI	X	CP	PHI	X	CP	PHI	X	CP
0.0	596.00	-.297	157.5	693.00	-.051	247.5	685.00	-.168
0.0	620.00	-.336	157.5	700.00	.033	252.5	685.00	-.151
0.0	637.00	-.106	180.0	590.15	-.075	282.0	685.00	-.122
0.0	665.00	-.042	180.0	625.35	-.064	292.5	685.00	-.113
0.0	675.00	-.183	180.0	661.60	-.069	315.0	644.35	-.045
0.0	685.00	-.195	180.0	685.00	-.144	315.0	658.00	-.103
0.0	687.00	-.190	180.0	687.30	-.142	315.0	670.25	-.117
0.0	693.00	-.173	180.0	693.00	-.089	315.0	685.00	-.146
0.0	700.00	.042	181.0	694.00	-.059	320.0	687.30	-.142
0.0	706.00	.121	180.0	700.00	.045	315.0	693.00	-.083
22.5	693.00	-.096	180.0	706.00	.106	315.0	695.00	-.008
22.5	700.00	.039	202.5	693.00	-.130	315.0	700.00	-.060
45.0	693.00	-.001	215.0	685.00	-.164	315.0	702.00	.106
45.0	706.00	.030	215.0	687.30	-.194	315.0	706.00	.131
45.0	685.00	-.112	225.0	520.00	-.100	TCL	658.70	.002
50.0	687.30	-.132	225.0	571.00	-.058	TCL	685.00	-.080
77.0	685.00	.051	225.0	611.00	-.017	BCL	586.00	-.088
90.0	693.00	.068	225.0	624.50	-.053	BCL	646.00	-.095
90.0	706.00	.026	225.0	643.00	-.111	BCL	671.00	-.045
135.0	685.00	-.026	225.0	667.00	-.102			
135.0	687.30	-.026	225.0	693.00	-.127			
135.0	693.00	-.022	225.0	695.00	-.023			
135.0	695.00	.039	225.0	700.00	.064			
135.0	700.00	.038	225.0	702.00	.115			
135.0	702.00	.036	225.0	706.00	.138			
135.0	706.00	.034						
135.0		.032						

TABLE 3.—Continued

M = .901	AN CG = .97	AE L = 205			
Q = 399.4	W = 21611	AE R = 205			
ALPHA = 1.38	OA L = 3.93	PS 1 = 716.0			
BETA = -.47	OH L = -.88	PS 2 = 713.2			
NPR = 3.42	OR L = -.22	H = 27525			
-6	DSB = -3.20	DEL P = -.03			
RN (10) = 2.81					
PHI	X	CP	PHI	X	CP
0.0	596.00	-.315	247.5	685.00	-.160
0.0	620.00	-.302	252.5	685.00	-.142
0.0	637.00	-.085	282.0	685.00	-.113
0.0	665.00	-.038	292.5	685.00	-.105
0.0	675.00	-.174	315.0	644.35	-.038
0.0	685.00	-.192	315.0	658.00	-.099
0.0	687.00	-.188	315.0	670.25	-.112
0.0	693.00	-.174	315.0	685.00	-.141
0.0	700.00	.048	320.0	687.30	-.160
0.0	706.00	.136	315.0	693.00	-.077
22.5	693.00	-.099	315.0	695.00	.003
22.5	700.00	.047	315.0	700.00	.075
45.0	693.00	-.001	315.0	702.00	.121
45.0	700.00	.030	315.0	706.00	.144
45.0	706.00	.036	TCL	658.70	.007
50.0	685.00	-.112	TCL	685.00	-.073
50.0	687.30	-.135	BCL	586.00	-.082
77.0	685.00	.054	BCL	646.00	-.088
90.0	693.00	.073	BCL	671.00	-.037
90.0	706.00	.029			
135.0	685.00	-.018			
135.0	687.30	-.012			
135.0	693.00	.046			
135.0	695.00	.042			
135.0	700.00	.041			
135.0	702.00	.039			
135.0	706.00	.038			

TABLE 3. --Continued

M = .925	AN CG = .94	AE L = 205			
Q = 213.7	M = 22498	AE R = 181			
ALPHA = 2.58	DA L = 16.28	PS 1 = 364.6			
SETA = -.59	DM L = -1.75	PS 2 = 361.4			
NPR = 4.15	DR L = .10	H = 41921			
⁻⁶ RH (10) = 1.60	DSB = -.30	DEL P = .02			
PHI	X	CP	PHI	X	CP
0.0	596.00	-.250	247.5	685.00	-.160
0.0	620.00	-.380	252.5	685.00	-.139
0.0	637.00	-.152	282.0	685.00	-.122
0.0	665.00	-.037	292.5	685.00	-.110
0.0	675.00	-.160	315.0	644.35	-.055
0.0	685.00	-.176	315.0	658.00	-.094
0.0	687.00	-.173	315.0	670.25	-.105
0.0	693.00	-.127	315.0	685.00	-.131
0.0	700.00	.054	320.0	687.30	-.144
0.0	706.00	.118	315.0	693.00	-.065
22.5	693.00	-.077	315.0	695.00	-.003
22.5	700.00	.036	315.0	700.00	.059
45.0	693.00	-.071	315.0	702.00	.109
45.0	700.00	.023	315.0	706.00	.131
45.0	706.00	.028	TCL	658.70	.005
50.0	685.00	-.096	TCL	685.00	-.072
50.0	687.30	-.115	BCL	586.00	-.091
77.0	685.00	.035	BCL	646.00	-.114
90.0	693.00	.057	BCL	671.00	-.052
90.0	706.00	.022			
135.0	685.00	-.030			
135.0	687.30	-.025			
135.0	693.00	.034			
135.0	695.00	.029			
135.0	700.00	.029			
135.0	702.00	.028			
135.0	706.00	.026			

TABLE 3. --Continued

M = .906	AN CG = .92	AE L = 227			
Q = 138.6	W = 21806	AE R = 225			
ALPHA = 3.55	DA L = 3.68	PS 1 = 246.0			
BETA = -.64	OH L = -2.11	PS 2 = 242.7			
NPR = 5.67	OR L = -.34	M = 50080			
-6	DSB = -3.14	DEL P = .04			
RN (10) = 1.09					
PHI	X	CP	PHI	X	CP
0.0	596.00	-.316	247.5	685.00	-.125
0.0	620.00	-.335	157.5	700.00	-.100
0.0	637.00	-.093	157.5	590.15	-.085
0.0	665.00	-.019	180.0	625.35	-.052
0.0	675.00	-.130	180.0	661.60	-.063
0.0	685.00	-.140	180.0	685.00	-.073
0.0	687.00	-.136	180.0	687.30	-.080
0.0	693.00	-.111	180.0	693.00	-.092
0.0	700.00	.072	161.0	694.00	-.100
0.0	705.00	.148	180.0	700.00	-.025
22.5	693.00	-.076	180.0	706.00	.033
22.5	700.00	.052	202.5	685.00	.089
45.0	693.00	.012	215.0	685.00	.133
45.0	700.00	.036	215.0	687.30	.156
45.0	705.00	.046	225.0	520.00	.017
50.0	685.00	-.078	225.0	571.00	-.055
50.0	687.30	-.097	225.0	611.00	-.073
77.0	685.00	.047	225.0	624.50	-.099
90.0	693.00	.065	225.0	643.00	-.037
90.0	706.00	.033	225.0	667.00	-.056
135.0	685.00	-.019	225.0	693.00	.035
135.0	687.30	-.018	225.0	695.00	.098
135.0	693.00	.040	225.0	700.00	.137
135.0	695.00	.043	225.0	702.00	.154
135.0	700.00	.041	225.0	706.00	
135.0	702.00	.047			
135.0	706.00	.056			

TABLE 3.—Continued

M = 1.185	AN CG = .89	AE L = 355			
Q = 783.8	W = 20584	AE R = 349			
ALPHA = .68	DA L = 4.07	PS 1 = 798.1			
BETA = -.34	DH L = .22	PS 2 = 794.3			
NPR = 5.92	DR L = -.21	H = 24642			
-6	DSB = -3.20	DEL P = .01			
RN (10 ⁻⁶) = 4.07					
PHI	X	CP	PHI	X	CP
0.0	596.00	-.088	247.5	685.00	-.182
0.0	620.00	-.165	252.5	685.00	-.182
0.0	637.00	-.203	282.0	685.00	-.252
0.0	665.00	-.109	292.5	685.00	-.252
0.0	675.00	-.184	315.0	644.35	-.087
0.0	685.00	-.229	315.0	658.00	-.167
0.0	687.00	-.237	315.0	670.25	-.133
0.0	693.00	-.301	315.0	685.00	-.248
0.0	700.00	-.379	320.0	687.30	-.264
0.0	706.00	-.041	315.0	693.00	-.212
22.5	693.00	-.216	315.0	695.00	-.317
22.5	700.00	-.406	315.0	700.00	-.303
45.0	693.00	-.311	315.0	702.00	-.072
45.0	700.00	-.151	315.0	706.00	-.015
45.0	706.00	-.051	TCL	658.70	-.259
50.0	685.00	-.220	TCL	685.00	-.216
50.0	687.30	-.298	BCL	586.00	-.346
77.0	685.00	-.114	BCL	646.00	-.083
90.0	693.00	-.078	BCL	671.00	-.047
90.0	706.00	-.104			
135.0	685.00	-.174			
135.0	687.30	-.117			
135.0	693.00	-.183			
135.0	695.00	-.278			
135.0	700.00	-.255			
135.0	702.00	-.056			
135.0	706.00	.005			

TABLE 3.—Continued

M = 1.181	AN CG = .92	AE L = 296
Q = 736.3	W = 21483	AE R = 327
ALPHA = .84	DA L = 9.05	PS 1 = 754.1
BETA = -.28	DH L = .00	PS 2 = 750.8
NPR = 6.26	DR L = -.76	H = 25940
RN (10 ⁻⁶) = 3.90	DSR = -.28	DEL P = .01

PHI	X	CP	PHI	X	CP
0.0	596.00	-.089	247.5	685.00	-.183
0.0	620.00	-.171	252.5	685.00	-.184
0.0	637.00	-.207	282.0	685.00	-.272
0.0	665.00	-.107	292.5	685.00	-.261
0.0	675.00	-.189	315.0	644.35	-.099
0.0	685.00	-.231	315.0	658.00	-.172
0.0	687.00	-.244	315.0	670.25	-.135
0.0	693.00	-.390	315.0	685.00	-.247
0.0	700.00	-.159	320.0	687.30	-.272
0.0	706.00	-.055	315.0	693.00	-.320
22.5	693.00	-.363	315.0	695.00	-.375
22.5	700.00	-.160	315.0	700.00	-.161
45.0	693.00	-.357	315.0	702.00	-.085
45.0	700.00	-.147	315.0	706.00	-.045
50.0	706.00	-.090	TCL	658.70	-.249
50.0	695.00	-.221	TCL	685.00	-.215
50.0	687.30	-.295	BCL	596.00	-.212
77.0	685.00	-.117	BCL	646.00	-.081
90.0	693.00	-.083	BCL	671.00	-.049
90.0	706.00	-.123			
135.0	685.00	-.181			
135.0	687.30	-.149			
135.0	693.00	-.264			
135.0	695.00	-.282			
135.0	700.00	-.144			
135.0	702.00	-.060			
135.0	706.00	-.027			

TABLE 3.—Continued

M = 1.166	AN CG = .96	AE L = 275			
Q = 595.1	W = 22679	AE R = 268			
ALPHA = 1.50	DA L = 13.91	PS 1 = 615.8			
BETA = -.36	DH L = -.61	PS 2 = 612.2			
NPR = 6.66	NR L = -.72	W = 30458			
-6	NSR = -.28	DEL P = -.00			
RN (10) = 3.26					
PHI	X	CP	PHI	X	CP
0.0	596.00	-.137	247.5	605.00	-.197
0.0	620.00	-.191	252.5	605.00	-.201
0.0	637.00	-.232	282.0	605.00	-.288
0.0	665.00	-.373	292.5	605.00	-.265
0.0	675.00	-.184	315.0	644.35	-.112
0.0	685.00	-.244	315.0	658.00	-.174
0.0	687.00	-.263	315.0	670.25	-.138
0.0	693.00	-.433	315.0	685.00	-.254
0.0	700.00	-.130	320.0	687.30	-.279
0.0	706.00	-.056	315.0	693.00	-.363
22.5	693.00	-.406	315.0	695.00	-.358
22.5	700.00	-.140	315.0	700.00	-.127
45.0	693.00	-.307	315.0	702.00	-.088
45.0	700.00	-.151	315.0	706.00	-.060
45.0	706.00	-.102	TOL	658.70	-.225
50.0	695.00	-.237	TOL	695.00	-.201
50.0	697.30	-.307	BOL	586.00	-.189
77.0	685.00	-.106	BOL	646.00	-.081
90.0	693.00	-.080	BOL	671.00	-.056
90.0	706.00	-.122			
135.0	685.00	-.188			
135.0	697.30	-.157			
135.0	693.00	-.279			
135.0	695.00	-.226			
135.0	700.00	-.123			
135.0	702.00	-.073			
135.0	706.00	-.047			

TABLE 3.—Continued

M = 1.168	AN CG = .83	AE L = 218			
Q = 395.9	W = 21248	AE R = 240			
ALPHA = 2.07	DA L = 16.96	PS 1 = 404.4			
BETA = -.58	DH L = -1.25	PS 2 = 401.5			
NPR = 7.54	DR L = -.25	W = 39347			
-6	DSR = -.32	DEL P = .03			
RN (10) = 2.32					
PHI	X	CP	PHI	X	CP
0.0	596.00	-.116	157.5	693.00	-.347
0.0	620.00	-.201	157.5	700.00	-.136
0.0	637.00	-.234	180.0	590.15	-.147
0.0	665.00	-.081	180.0	625.35	-.124
0.0	675.00	-.190	180.0	661.60	-.073
0.0	685.00	-.237	180.0	685.00	-.180
0.0	687.00	-.256	180.0	687.30	-.237
0.0	693.00	-.406	180.0	693.00	-.346
0.0	700.00	-.122	181.0	694.00	-.381
0.0	706.00	-.073	180.0	700.00	-.147
22.5	693.00	-.459	180.0	705.00	-.049
22.5	700.00	-.133	202.5	693.00	-.342
45.0	693.00	-.228	215.0	685.00	-.170
45.0	700.00	-.143	215.0	697.30	-.223
45.0	706.00	-.103	225.0	520.00	-.002
50.0	685.00	-.224	225.0	571.00	-.062
50.0	697.30	-.291	225.0	611.00	-.108
77.0	685.00	-.095	225.0	624.50	-.050
90.0	693.00	-.072	225.0	643.00	-.070
135.0	705.00	-.116	225.0	667.00	-.122
135.0	685.00	-.185	225.0	693.00	-.419
135.0	687.30	-.168	225.0	695.00	-.204
135.0	693.00	-.254	225.0	700.00	-.127
135.0	695.00	-.159	225.0	702.00	-.094
135.0	700.00	-.119	225.0	705.00	-.084
135.0	702.00	-.097			
135.0	706.00	-.079			
			247.5	685.00	-.200
			252.5	685.00	-.214
			262.0	685.00	-.295
			292.5	685.00	-.265
			315.0	644.35	-.105
			315.0	658.00	-.160
			315.0	670.25	-.137
			315.0	685.00	-.244
			320.0	687.30	-.276
			315.0	693.00	-.369
			315.0	695.00	-.176
			315.0	700.00	-.136
			315.0	702.00	-.117
			315.0	706.00	-.097
			TCL	658.70	-.195
			TCL	685.00	-.261
			BCL	586.00	-.160
			BCL	646.00	-.085
			BCL	671.00	-.058

TABLE 3.—Continued

W = 1.250	AN CG = .95	AE L = 292			
Q = 266.3	W = 21094	AE R = 292			
ALPHA = 2.85	DA L = 3.95	PS 1 = 243.6			
BETA = -.54	DH L = -2.78	PS 2 = 240.5			
MPR = 8.08	DR L = -.09	M = 49891			
RN (10 ⁻⁶) = 1.54	DSB = -3.17	DEL P = .07			
PHI	X	CP	PHI	X	CP
0.0	596.00	-.085	247.5	685.00	-.201
0.0	620.00	-.180	252.5	685.00	-.212
0.0	637.00	-.220	282.0	685.00	-.279
0.0	665.00	-.105	292.5	685.00	-.239
0.0	675.00	-.221	315.0	644.35	-.084
0.0	685.00	-.185	315.0	658.00	-.153
0.0	687.00	-.193	315.0	670.25	-.134
0.0	693.00	-.307	315.0	685.00	-.200
0.0	700.00	-.074	320.0	687.30	-.227
0.0	706.00	-.030	315.0	693.00	-.271
22.5	693.00	-.334	315.0	695.00	-.224
22.5	700.00	-.065	315.0	700.00	-.071
45.0	693.00	-.201	315.0	702.00	-.024
45.0	700.00	-.091	315.0	706.00	-.006
45.0	706.00	-.044	TCL	658.70	-.126
50.0	685.00	-.184	TCL	685.00	-.266
50.0	687.30	-.243	BCL	586.00	-.135
77.0	685.00	-.070	BCL	646.00	-.116
90.0	693.00	-.045	BCL	671.00	-.054
90.0	706.00	-.070			
135.0	685.00	-.151			
135.0	687.30	-.142			
135.0	693.00	-.191			
135.0	695.00	-.157			
135.0	700.00	-.074			
135.0	702.00	-.036			
135.0	706.00	-.016			

TABLE 3.—Continued

M = 1.472	AN CG = .91	AE L = 300
Q = 597.0	W = 21754	AE R = 298
ALPHA = 1.25	DA L = 3.26	PS 1 = 393.9
BETA = -.62	DH L = .10	PS 2 = 390.0
NPR = 8.92	DR L = .99	W = 39902
RN (10 ⁻⁶) = 2.82	DSB = -3.06	DEL P = .10

PHI	X	CP	PHI	X	CP
0.0	596.00	-.032	157.5	693.00	-.130
0.0	620.00	-.089	157.5	700.00	-.286
0.0	637.00	-.123	180.0	590.15	-.087
0.0	665.00	-.090	180.0	625.35	-.079
0.0	675.00	-.206	180.0	661.60	-.074
0.0	685.00	-.206	180.0	685.00	-.108
0.0	687.00	-.218	180.0	687.30	-.198
0.0	693.00	-.247	180.0	693.00	-.142
0.0	700.00	-.087	181.0	694.00	-.170
0.0	706.00	-.032	180.0	700.00	-.251
22.5	693.00	-.211	180.0	706.00	-.008
22.5	700.00	-.091	202.5	693.00	-.154
45.0	693.00	-.252	215.0	685.00	-.130
45.0	700.00	-.076	215.0	687.30	-.155
45.0	706.00	-.041	225.0	520.00	-.009
50.0	685.00	-.111	225.0	571.00	-.075
50.0	687.30	-.170	225.0	611.00	-.080
77.0	685.00	-.054	225.0	624.50	-.070
90.0	693.00	-.034	225.0	643.00	-.033
90.0	706.00	-.061	225.0	667.00	-.098
135.0	685.00	-.094	225.0	693.00	-.200
135.0	687.30	-.100	225.0	695.00	-.250
135.0	693.00	-.161	225.0	700.00	-.106
135.0	695.00	-.190	225.0	702.00	-.029
135.0	700.00	-.092	225.0	706.00	-.009
135.0	702.00	-.019			
135.0	706.00	.003			
			247.5	685.00	-.163
			252.5	685.00	-.170
			282.0	685.00	-.219
			292.5	685.00	-.202
			315.0	644.35	-.055
			315.0	658.00	-.095
			315.0	670.25	-.106
			315.0	685.00	-.179
			320.0	687.30	-.215
			315.0	693.00	-.228
			315.0	695.00	-.294
			315.0	700.00	-.090
			315.0	702.00	-.055
			315.0	706.00	-.031
			TCL	658.70	-.156
			TCL	685.00	-.158
			BCL	586.00	-.073
			BCL	646.00	-.119
			BCL	671.00	-.018

TABLE 3.—Continued

[illegible]

TABLE 3.—Continued

M = 1.593	AN CG = .99	AE L = 360			
Q = 841.0	W = 21130	AE R = 372			
ALPHA = .81	DA L = 1.17	PS 1 = 473.7			
BETA = -.57	DH L = 1.03	PS 2 = 469.7			
NPR = 8.75	OR L = 1.13	W = 36063			
-6	OSB = -3.08	DEL P = .10			
RN (10) = 3.39					
PHI	X	CP	PHI	X	CP
0.0	596.00	-.016	247.5	685.00	-.136
0.0	620.00	-.070	252.5	685.00	-.143
0.0	637.00	-.101	282.0	685.00	-.184
0.0	665.00	-.081	292.5	685.00	-.171
0.0	675.00	-.179	315.0	644.35	-.047
0.0	685.00	-.177	315.0	658.00	-.080
0.0	687.00	-.191	315.0	670.25	-.086
0.0	693.00	-.196	315.0	685.00	-.148
0.0	700.00	-.098	320.0	687.30	-.183
0.0	706.00	-.001	315.0	693.00	-.130
22.5	693.00	-.136	315.0	695.00	-.178
22.5	700.00	-.164	315.0	700.00	-.121
45.0	693.00	-.146	315.0	702.00	-.020
45.0	700.00	-.016	315.0	706.00	.005
45.0	706.00	.012	TCL	658.70	-.058
50.0	685.00	-.103	TCL	685.00	-.117
50.0	687.30	-.140	BCL	586.00	-.119
50.0	695.00	-.003	BCL	646.00	-.142
90.0	693.00	.013	BCL	671.00	-.009
90.0	706.00	.004			
135.0	685.00	-.065			
135.0	687.30	-.080			
135.0	693.00	-.050			
135.0	695.00	-.104			
135.0	700.00	-.101			
135.0	702.00	.024			
135.0	706.00	.056			

TABLE 3.—Continued

M = .963	AN CG = 1.24	AE L = 168			
Q = 164.0	W = 21539	AE R = 224			
ALPHA = 4.37	DA L = 16.53	PS 1 = 258.8			
BETA = -.76	DH L = -3.86	PS 2 = 256.9			
NPR = 6.11	DR L = .05	H = 49140			
RN (13) = 1.22	DS9 = -.32	DEL P = .04			
PHI	X	CP	PHI	X	CP
0.0	596.00	-.323	157.5	693.00	.022
0.0	620.00	-.363	157.5	700.00	.063
0.0	637.00	-.074	180.0	590.15	-.040
0.0	665.00	.026	180.0	625.35	-.035
0.0	675.00	-.049	180.0	661.60	-.070
0.0	685.00	-.091	180.0	685.00	-.103
0.0	687.00	-.089	180.0	687.30	-.040
0.0	693.00	-.070	180.0	693.00	-.005
0.0	700.00	.106	181.0	694.00	.020
0.0	706.00	.172	180.0	700.00	.089
22.5	693.00	-.037	180.0	706.00	.135
22.5	700.00	.076	202.5	693.00	-.025
45.0	693.00	.033	215.0	685.00	-.124
45.0	700.00	.058	215.0	687.30	-.118
45.0	706.00	.064	225.0	620.00	-.114
50.0	685.00	-.036	225.0	571.00	-.089
50.0	687.30	-.050	225.0	611.00	.025
77.0	685.00	.063	225.0	624.50	-.026
90.0	693.00	.081	225.0	643.00	-.116
90.0	706.00	.057	225.0	667.00	-.109
135.0	685.00	.032	225.0	693.00	-.008
135.0	687.30	.037	225.0	695.00	.066
135.0	693.00	.068	225.0	700.00	.113
135.0	695.00	.061	225.0	702.00	.145
135.0	700.00	.058	225.0	706.00	.162
135.0	702.00	.053			
135.0	706.00	.050			
			247.5	685.00	-.130
			252.5	685.00	-.080
			282.0	685.00	-.054
			292.5	685.00	-.036
			315.0	644.35	.013
			315.0	658.00	-.011
			315.0	670.25	-.019
			315.0	685.00	-.041
			320.0	687.30	-.047
			315.0	693.00	.009
			315.0	695.00	.054
			315.0	700.00	.114
			315.0	702.00	.159
			315.0	706.00	.181
			TCL	658.70	.033
			TCL	685.00	-.001
			BCL	586.00	-.062
			BCL	646.00	-.094
			BCL	671.00	-.004

TABLE 3.—Continued

M = .955	AN CG = 1.19	AE L = 224			
Q = 156.7	M = 21556	AE R = 223			
ALPHA = 4.47	PA L = 12.26	PS 1 = 251.3			
BETA = -.74	PH L = -3.62	PS 2 = 248.8			
NPR = 6.07	PP L = .02	M = 49727			
RN (10) = 1.19	PSR = -.30	DEL P = .04			
PHI	X	CP	PHI	X	CP
0.0	596.00	-.283	247.5	685.00	-.116
0.0	620.00	-.347	252.5	685.00	-.084
0.0	637.00	-.076	282.0	685.00	-.063
0.0	665.00	.013	292.5	685.00	-.047
0.0	675.00	-.067	315.0	644.35	.003
0.0	685.00	-.105	315.0	656.00	-.028
0.0	697.00	-.103	315.0	670.25	-.037
0.0	693.00	-.082	315.0	685.00	-.057
0.0	700.00	.099	320.0	687.30	-.064
0.0	706.00	.164	315.0	693.00	-.001
22.5	693.00	-.047	315.0	695.00	.046
22.5	700.00	.067	315.0	700.00	.106
45.0	693.00	.024	315.0	702.00	.150
45.0	700.00	.049	315.0	706.00	.172
45.0	706.00	.054	TCL	658.70	.028
50.0	685.00	-.047	TCL	685.00	-.014
50.0	687.30	-.061	BCL	586.00	-.062
77.0	685.00	.053	BCL	646.00	-.105
90.0	693.00	.071	BCL	671.00	-.018
90.0	706.00	.048			
135.0	685.00	.018			
135.0	697.30	.026			
135.0	693.00	.059			
135.0	695.00	.051			
135.0	703.00	.051			
135.0	702.00	.049			
135.0	706.00	.040			

TABLE 3.—Continued

M = 1.243	AN CG = 1.20	AE L = 305			
Q = 276.1	W = 21886	AE R = 337			
ALPHA = 3.05	DA L = 16.94	PS 1 = 255.5			
BETA = -.40	DM L = -3.78	PS 2 = 253.0			
NPR = 7.94	DE L = .02	H = 48902			
RN (10) = 1.59	DSR = -.33	DEL P = .06			
-6					
PHI	X	CP	PHI	X	CP
0.0	596.00	-.090	157.5	693.00	-.191
0.0	620.00	-.207	157.5	700.00	-.155
0.0	637.00	-.246	180.0	590.15	-.096
0.0	665.00	-.113	180.0	625.35	-.110
0.0	675.00	-.219	180.0	661.60	-.104
0.0	685.00	-.190	180.0	685.00	-.167
0.0	687.00	-.194	180.0	687.30	0.000
0.0	693.00	-.258	180.0	693.00	-.210
0.0	700.00	-.063	181.0	694.00	-.242
0.0	706.00	-.024	180.0	700.00	-.133
22.5	693.00	-.279	180.0	706.00	.008
22.5	700.00	-.035	202.5	693.00	-.219
45.0	693.00	-.146	215.0	685.00	-.121
45.0	700.00	-.058	215.0	687.30	-.208
45.0	706.00	-.023	225.0	520.00	.058
50.0	685.00	-.164	225.0	571.00	-.024
50.0	687.30	-.214	225.0	611.00	-.084
77.0	685.00	-.029	225.0	624.50	-.062
90.0	693.00	-.010	225.0	643.00	-.062
90.0	706.00	-.051	225.0	667.00	-.125
135.0	685.00	-.137	225.0	693.00	-.278
135.0	697.30	-.122	225.0	695.00	-.253
135.0	693.00	-.136	225.0	700.00	-.087
135.0	695.00	-.115	225.0	702.00	-.050
135.0	700.00	-.057	225.0	706.00	-.017
135.0	702.00	-.015			
135.0	706.00	.005			
			247.5	685.00	-.213
			252.5	685.00	-.231
			282.0	685.00	-.302
			292.5	685.00	-.245
			315.0	644.35	-.100
			315.0	658.00	-.166
			315.0	670.25	-.144
			315.0	685.00	-.213
			320.0	687.30	-.240
			315.0	693.00	-.255
			315.0	695.00	-.173
			315.0	700.00	-.047
			315.0	702.00	-.005
			315.0	706.00	.007
			TCL	658.70	-.087
			TCL	685.00	-.279
			BCL	586.00	-.117
			BCL	646.00	-.132
			BCL	671.00	-.062

TABLE 3.—Continued

M = 1.242	AN CG = 1.10	AE L = 302			
Q = 265.7	W = 21719	AE R = 330			
ALPHA = 3.07	OA L = 17.00	PS 1 = 246.4			
BETA = -.49	OH L = -3.66	PS 2 = 243.6			
NPR = 7.90	DR L = .04	M = 49661			
RN (10 ⁻⁶) = 1.55	OSR = -.32	DEL P = .05			
PHI	X	CP	PHI	X	CP
0.0	596.00	-.094	247.5	695.00	-.209
0.0	620.00	-.203	252.5	685.00	-.223
0.0	637.00	-.239	282.0	685.00	-.310
0.0	665.00	-.112	292.5	685.00	-.243
0.0	675.00	-.219	315.0	644.35	-.094
0.0	685.00	-.138	315.0	658.00	-.164
0.0	687.00	-.195	315.0	670.25	-.142
0.0	693.00	-.267	315.0	685.00	-.206
0.0	700.00	-.067	320.0	687.30	-.238
0.0	706.00	-.025	315.0	693.00	-.261
22.5	693.00	-.289	315.0	695.00	-.146
22.5	700.00	-.040	315.0	700.00	-.047
45.0	693.00	-.150	315.0	702.00	-.007
45.0	700.00	-.063	315.0	706.00	.005
45.0	706.00	-.028	TCL	658.70	-.089
50.0	685.00	-.164	TCL	685.00	-.276
50.0	687.30	-.211	BCL	586.00	-.120
77.0	685.00	-.032	BCL	646.00	-.128
90.0	693.00	-.015	BCL	671.00	-.061
90.0	706.00	-.053			
135.0	685.00	-.138			
135.0	687.30	-.127			
135.0	693.00	-.145			
135.0	695.00	-.119			
135.0	700.00	-.060			
135.0	702.00	-.019			
135.0	706.00	.002			

TABLE 3.—Continued

M = .093	AN CG = 1.32	AE L = 235			
O = 137.1	W = 22016	AE R = 241			
ALPHA = 5.84	OA L = 4.30	PS 1 = 250.1			
BETA = .63	DH L = -2.22	PS 2 = 247.1			
NPR = 5.63	DR L = 1.93	W = 49716			
-6	DSB = -3.14	OEL P = .04			
RN (10) = 1.09					
PHI	X	CP	PHI	X	CP
0.0	596.00	-.328	157.5	693.00	-.057
0.0	620.00	-.296	157.5	700.00	.054
0.0	637.00	-.094	180.0	590.15	-.058
0.0	665.00	-.020	180.0	625.35	-.054
0.0	675.00	-.129	180.0	661.60	-.055
0.0	685.00	-.134	180.0	685.00	-.126
0.0	687.00	-.129	180.0	687.30	-.119
0.0	693.00	-.101	180.0	693.00	-.053
0.0	700.00	.071	161.0	694.00	-.022
0.0	706.00	.144	180.0	700.00	.071
22.5	693.00	-.073	180.0	706.00	.126
22.5	700.00	.050	202.5	693.00	-.067
45.0	693.00	.004	215.0	685.00	-.121
45.0	700.00	.033	215.0	687.30	-.127
45.0	706.00	.050	225.0	520.00	-.044
50.0	685.00	-.079	225.0	571.00	-.037
50.0	687.30	-.091	225.0	611.00	.006
77.0	685.00	.044	225.0	624.50	-.035
90.0	693.00	.064	225.0	643.00	-.094
90.0	706.00	.038	225.0	667.00	-.085
135.0	685.00	-.040	225.0	693.00	-.045
135.0	687.30	-.037	225.0	695.00	.038
135.0	693.00	.010	225.0	700.00	.086
135.0	695.00	.035	225.0	702.00	.118
135.0	700.00	.043	225.0	706.00	.139
135.0	702.00	.059			
135.0	706.00	.078			
			247.5	685.00	-.129
			252.5	685.00	-.118
			282.0	685.00	-.094
			292.5	685.00	-.074
			315.0	644.35	-.027
			315.0	658.00	-.074
			315.0	670.25	-.081
			315.0	685.00	-.091
			320.0	687.30	-.097
			315.0	693.00	-.027
			315.0	695.00	.030
			315.0	700.00	.092
			315.0	702.00	.132
			315.0	706.00	.154
			TCL	658.70	.010
			TCL	605.00	-.058
			BCL	586.00	-.065
			BCL	646.00	-.100
			BCL	671.00	-.046

TABLE 3.—Continued

PHI	X	CP	PHI	X	CP	PHI	X	CP
0.0	596.00	-.215	157.5	693.00	-.122	247.5	685.00	-.150
0.0	620.00	-.164	157.5	700.00	-.000	252.5	685.00	-.139
0.0	637.00	-.101	180.0	590.15	-.000	282.0	685.00	-.141
0.0	665.00	-.049	180.0	625.35	-.049	292.5	685.00	-.113
0.0	675.00	-.175	180.0	661.60	-.047	315.0	644.35	-.052
0.0	685.00	-.194	180.0	685.00	-.159	315.0	658.00	-.094
0.0	687.00	-.201	180.0	687.30	-.174	315.0	670.25	-.097
0.0	693.00	-.211	180.0	693.00	-.145	315.0	685.00	-.135
0.0	700.00	.004	181.0	694.00	-.113	320.0	687.30	-.161
0.0	706.00	.112	180.0	700.00	.001	315.0	693.00	-.109
22.5	693.00	-.163	180.0	706.00	.100	315.0	695.00	-.042
22.5	700.00	.018	202.5	693.00	-.159	315.0	700.00	.034
45.0	693.00	-.046	215.0	685.00	-.145	315.0	702.00	.089
45.0	700.00	.010	215.0	687.30	-.174	315.0	706.00	.121
45.0	706.00	.023	225.0	520.00	-.036	TCL	658.70	-.031
50.0	685.00	-.144	225.0	571.00	-.042	TCL	685.00	-.096
50.0	687.30	-.182	225.0	611.00	-.014	BCL	586.00	-.073
77.0	685.00	.039	225.0	624.50	-.042	BCL	646.00	-.081
90.0	693.00	.054	225.0	643.00	-.068	BCL	671.00	-.055
90.0	706.00	.013	225.0	667.00	-.060			
135.0	685.00	-.092	225.0	693.00	-.155			
135.0	687.30	-.091	225.0	695.00	-.072			
135.0	693.00	-.030	225.0	700.00	.025			
135.0	695.00	.019	225.0	702.00	.066			
135.0	700.00	.030	225.0	706.00	.111			
135.0	702.80	.041						
135.0	706.00	.051						

M = .599

Q = 366.6

ALPHA = 2.33

BETA = -.46

NPR = 1.86

RN (10⁻⁶) = 3.23

AN CG = 1.93

W = 20278

DA L = 12.88

DH L = -1.09

DR L = -.12

DSB = -.40

AE L = 205

AE R = 205

PS 1 = 1469.3

PS 2 = 1411.0

M = 9954

DEL P = -.08

TABLE 3.—Continued

M = .629	AN CG = 1.73	AE L = 204			
Q = 296.1	W = 22427	AE R = 204			
ALPHA = 4.13	DA L = 4.13	PS 1 = 1079.0			
BETA = -.75	DH L = -1.38	PS 2 = 1076.1			
NPR = 2.03	OR L = -.44	M = 17701			
⁻⁶ RN (10) = 2.70	DSB = -3.21	DEL P = -.03			
PHI	X	CP	PHI	X	CP
0.0	596.00	-.216	247.5	685.00	-.156
0.0	620.00	-.164	252.5	685.00	-.145
0.0	637.00	-.098	282.0	685.00	-.147
0.0	665.00	-.049	292.5	685.00	-.115
0.0	675.00	-.172	315.0	644.35	-.055
0.0	685.00	-.193	315.0	658.00	-.095
0.0	687.00	-.202	315.0	670.25	-.097
0.0	693.00	-.199	315.0	685.00	-.138
0.0	700.00	.010	320.0	697.30	-.164
0.0	706.00	.109	315.0	693.00	-.106
22.5	693.00	-.154	315.0	695.00	-.039
22.5	700.00	.018	315.0	700.00	.037
45.0	693.00	-.041	315.0	702.00	.093
45.0	700.00	.013	315.0	706.00	.122
45.0	706.00	.027	TCL	658.70	-.029
50.0	685.00	-.140	TCL	685.00	-.097
50.0	687.30	-.175	BCL	586.00	.010
77.0	685.00	.033	BCL	646.00	-.079
90.0	693.00	.056	BCL	671.00	-.054
90.0	706.00	.022			
135.0	685.00	-.087			
135.0	687.30	-.085			
135.0	693.00	-.009			
135.0	695.00	.025			
135.0	700.00	.029			
135.0	702.00	.039			
135.0	706.00	.040			

TABLE 3.—Continued

M = .603	AN CG = 2.14	AE L = 204			
Q = 278.6	M = 22398	AE R = 204			
ALPHA = 5.44	DA L = 3.59	PS 1 = 1101.5			
BETA = -.80	DH L = -1.63	PS 2 = 1100.1			
NPR = 2.02	OR L = -.40	M = 17190			
-6	DSB = -3.27	DEL P = -.02			
RN (10 ⁻⁶) = 2.62					
PHI	X	CP	PHI	X	CP
0.0	596.00	-.216	157.5	693.00	-.122
0.0	620.00	-.162	157.5	700.00	.004
0.0	637.00	-.099	180.0	590.15	-.040
0.0	665.00	-.045	180.0	625.35	-.038
0.0	675.00	-.169	180.0	661.60	-.038
0.0	685.00	-.130	180.0	685.00	-.158
0.0	687.00	-.189	180.0	687.30	-.175
0.0	693.00	-.182	180.0	693.00	-.143
0.0	700.00	.014	181.0	694.00	-.116
0.0	706.00	.103	180.0	700.00	.009
22.5	693.00	-.143	180.0	706.00	.100
22.5	700.00	.020	202.5	693.00	-.154
45.0	693.00	-.039	215.0	685.00	-.140
45.0	700.00	.013	215.0	687.30	-.168
45.0	706.00	.027	225.0	520.00	-.008
50.0	685.00	-.134	225.0	571.00	-.030
50.0	687.30	-.163	225.0	611.00	-.002
77.0	685.00	.034	225.0	624.50	-.029
90.0	693.00	.052	225.0	643.00	-.059
90.0	706.00	.021	225.0	667.00	-.054
135.0	685.00	-.096	225.0	693.00	-.143
135.0	687.30	-.093	225.0	695.00	-.062
135.0	693.00	-.019	225.0	700.00	.034
135.0	695.00	.023	225.0	702.00	.079
135.0	700.00	.028	225.0	706.00	.099
135.0	702.00	.038			
135.0	706.00	.045			
			247.5	685.00	-.148
			252.5	685.00	-.141
			282.0	685.00	-.149
			292.5	685.00	-.110
			315.0	644.35	-.052
			315.0	658.00	-.091
			315.0	670.25	-.093
			315.0	685.00	-.130
			320.0	687.30	-.153
			315.0	693.00	-.100
			315.0	695.00	-.036
			315.0	700.00	.038
			315.0	702.00	.092
			315.0	706.00	.121
			TCL	658.70	-.031
			TCL	685.00	-.096
			BCL	586.00	.016
			BCL	646.00	-.073
			BCL	671.00	-.053

TABLE 3. -Continued

M = .615	AN CG = 1.71	AE L = 205			
Q = 207.6	M = 23704	AE R = 206			
ALPHA = 6.49	DA L = 1.24	PS 1 = 790.6			
BETA = -.61	DM L = -2.07	PS 2 = 786.9			
NPR = 2.52	DR L = -.15	M = 25035			
-6	DSB = -.37	DEL P = -.01			
RN (10) = 2.09					
PHI	X	CP	PHI	X	CP
0.0	596.00	-.225	247.5	685.00	-.153
0.0	620.00	-.172	252.5	685.00	-.144
0.0	637.00	-.108	282.0	685.00	-.149
0.0	665.00	-.042	292.5	685.00	-.107
0.0	675.00	-.171	315.0	644.35	-.053
0.0	685.00	-.172	315.0	658.00	-.092
0.0	687.00	-.177	315.0	670.25	-.091
0.0	693.00	-.167	315.0	685.00	-.122
0.0	700.00	.016	320.0	687.30	-.142
0.0	706.00	.100	315.0	693.00	-.090
22.5	693.00	-.138	315.0	695.00	-.031
22.5	700.00	.015	315.0	700.00	.040
45.0	693.00	-.041	315.0	702.00	.095
45.0	700.00	.007	315.0	706.00	.120
45.0	706.00	.024	TCL	658.70	-.033
50.0	685.00	-.129	TCL	685.00	-.095
50.0	687.30	-.155	BCL	586.00	-.059
77.0	685.00	.030	BCL	646.00	-.079
90.0	693.00	.049	BCL	671.00	-.055
90.0	706.00	.011			
135.0	685.00	-.104			
135.0	687.30	-.106			
135.0	693.00	-.038			
135.0	695.00	.009			
135.0	700.00	.024			
135.0	702.00	.037			
135.0	706.00	.049			

TABLE 3.-Continued

M = .932	AN CG = 1.99	AE L = 205			
Q = 437.7	W = 22344	AE R = 205			
ALPHA = 2.44	DA L = .91	PS 1 = 734.9			
BETA = -.61	DH L = -2.21	PS 2 = 733.1			
NPR = 4.28	DR L = -.31	H = 26994			
RN (10 ⁻⁶) = 2.93	DSB = -.25	OEL P = -.03			
PHI	X	CP	PHI	X	CP
0.0	596.00	-.267	247.5	685.00	-.153
0.0	620.00	-.354	252.5	685.00	-.126
0.0	637.00	-.130	282.0	685.00	-.112
0.0	665.00	-.019	292.5	685.00	-.097
0.0	675.00	-.145	315.0	644.35	-.029
0.0	685.00	-.168	315.0	658.00	-.074
0.0	687.00	-.161	315.0	670.25	-.087
0.0	693.00	-.143	315.0	685.00	-.120
0.0	700.00	.067	320.0	687.30	-.133
0.0	706.00	.147	315.0	693.00	-.068
22.5	693.00	-.084	315.0	695.00	.001
22.5	700.00	.057	315.0	700.00	.071
45.0	693.00	.009	315.0	702.00	.129
45.0	700.00	.033	315.0	706.00	.156
45.0	706.00	.041	TCL	658.70	.020
50.0	685.00	-.095	TCL	685.00	-.055
50.0	687.30	-.119	BCL	586.00	-.075
77.0	685.00	.059	BCL	646.00	-.104
90.0	693.00	.075	BCL	671.00	-.038
90.0	706.00	.037			
135.0	685.00	-.006			
135.0	687.30	.001			
135.0	693.00	.052			
135.0	695.00	.047			
135.0	700.00	.045			
135.0	702.00	.040			
135.0	706.00	.035			

TABLE 3.—Continued

M = .866	AN CG = 1.86	AE L = 205			
Q = 362.4	W = 21144	AE R = 204			
ALPHA = 2.63	DA L = 2.35	PS 1 = 702.0			
BETA = -.68	DH L = -1.32	PS 2 = 698.7			
NPR = 3.40	DR L = -.54	H = 27919			
-6	DSB = -3.22	DEL P = -.03			
RN (10) = 2.80					
PHI	X	CP	PHI	X	CP
0.0	596.00	-.346	247.5	685.00	-.166
0.0	620.00	-.205	252.5	685.00	-.151
0.0	637.00	-.092	282.0	685.00	-.127
0.0	665.00	-.041	292.5	685.00	-.110
0.0	675.00	-.180	315.0	644.35	-.046
0.0	685.00	-.193	315.0	658.00	-.103
0.0	687.00	-.194	315.0	670.25	-.112
0.0	693.00	-.177	315.0	685.00	-.143
0.0	700.00	.045	320.0	687.30	-.163
0.0	706.00	.133	315.0	693.00	-.081
22.5	693.00	-.108	315.0	695.00	-.000
22.5	700.00	.044	315.0	700.00	.074
45.0	693.00	-.010	315.0	702.00	.121
45.0	700.00	.026	315.0	706.00	.144
45.0	706.00	.026	TCL	658.70	.007
50.0	685.00	-.114	TCL	685.00	-.082
50.0	697.30	-.139	BCL	586.00	-.081
77.0	685.00	.048	BCL	646.00	-.091
90.0	693.00	.067	BCL	671.00	-.049
90.0	706.00	.026			
135.0	685.00	-.041			
135.0	687.30	-.036			
135.0	693.00	.033			
135.0	695.00	.040			
135.0	700.00	.039			
135.0	702.00	.037			
135.0	706.00	.037			

TABLE 3.—Continued

M = .954	AN CG = 2.36	AE L = 220			
Q = 224.5	W = 20251	AE R = 220			
ALPHA = 4.75	DA L = .90	PS 1 = 360.9			
BETA = -.77	DH L = -3.64	PS 2 = 359.2			
NPR = 5.99	OR L = -.46	H = 42197			
RN (10) = 1.62	OSB = -.23	DEL P = .03			
-6					
PHI	X	CP	PHI	X	CP
0.0	596.00	-.261	157.5	693.00	.000
0.0	620.00	-.335	157.5	700.00	.060
0.0	637.00	-.086	180.0	590.15	-.039
0.0	665.00	.012	180.0	625.35	-.043
0.0	675.00	-.082	180.0	661.60	-.074
0.0	685.00	-.113	180.0	685.00	-.118
0.0	687.00	-.110	180.0	687.30	-.153
0.0	693.00	-.089	180.0	693.00	-.025
0.0	700.00	.091	181.0	694.00	.004
0.0	706.00	.162	180.0	700.00	.084
22.5	693.00	-.057	180.0	706.00	.133
22.5	700.00	.068	202.5	693.00	-.050
45.0	693.00	.021	215.0	685.00	-.131
45.0	700.00	.049	215.0	687.30	-.127
45.0	706.00	.053	225.0	520.00	-.125
50.0	685.00	-.057	225.0	571.00	-.030
50.0	687.30	-.075	225.0	611.00	.024
77.0	685.00	.059	225.0	624.50	-.030
90.0	693.00	.075	225.0	643.00	-.115
90.0	706.00	.050	225.0	667.00	-.109
135.0	685.00	.013	225.0	693.00	-.026
135.0	687.30	.021	225.0	695.00	.054
135.0	693.00	.061	225.0	700.00	.106
135.0	695.00	.053	225.0	702.00	.140
135.0	700.00	.050	225.0	706.00	.154
135.0	702.00	.046			
135.0	706.00	.045			
			247.5	505.00	-.107
			252.5	505.00	-.003
			282.0	505.00	-.061
			292.5	505.00	-.051
			315.0	644.35	.006
			315.0	658.00	-.027
			315.0	670.25	-.039
			315.0	685.00	-.060
			320.0	687.30	-.069
			315.0	593.00	-.012
			315.0	695.00	.037
			315.0	700.00	.103
			315.0	702.00	.151
			706.00	706.00	.178
			658.70	658.70	.026
			TCL	585.00	-.016
			BCL	586.00	-.059
			BCL	646.00	-.103
			BCL	671.00	-.021

TABLE 3.—Continued

M = 1.200			AN CG = 2.12			AE L = 296		
C = 764.6			W = 2107.9			AE R = 309		
ALPHA = 2.10			DA L = 8.18			PS 1 = 759.2		
BETA = -.44			OH L = -1.79			PS 2 = 759.3		
NPR = 6.35			OR L = -1.31			H = 25790		
RN (10 ⁻⁶) = 3.77			DSB = -.23			DEL P = .01		
PHI	X	CP	PHI	X	CP	PHI	X	CP
0.0	596.00	-.080	157.5	693.00	-.219	247.5	605.00	-.203
0.0	620.00	-.185	157.5	700.00	-.404	252.5	605.00	-.211
0.0	637.00	-.226	180.0	590.15	-.129	262.0	605.00	-.271
0.0	665.00	-.109	180.0	625.35	-.119	292.5	605.00	-.245
0.0	675.00	-.173	180.0	661.60	-.079	315.0	644.35	-.092
0.0	685.00	-.204	180.0	685.00	-.168	315.0	658.00	-.164
0.0	687.00	-.219	180.0	687.30	-.202	315.0	670.25	-.137
0.0	693.00	-.372	180.0	693.00	-.215	315.0	685.00	-.229
0.0	700.00	-.154	181.0	694.00	-.241	320.0	687.30	-.252
0.0	706.00	-.049	180.0	700.00	-.354	315.0	693.00	-.310
22.5	693.00	-.341	180.0	706.00	-.065	315.0	695.00	-.354
22.5	700.00	-.160	202.5	693.00	-.209	315.0	700.00	-.145
45.0	693.00	-.351	215.0	685.00	-.159	315.0	702.00	-.061
45.0	700.00	-.142	215.0	687.30	-.206	315.0	706.00	-.035
45.0	706.00	-.090	225.0	520.00	-.022	TCL	658.70	-.241
50.0	685.00	-.193	225.0	571.00	-.035	TCL	685.00	-.243
50.0	687.30	-.267	225.0	611.00	-.105	BCL	686.00	-.171
77.0	685.00	-.109	225.0	624.50	-.061	BCL	646.00	-.099
90.0	693.00	-.078	225.0	643.00	-.065	BCL	671.00	-.052
90.0	706.00	-.120	225.0	667.00	-.123			
135.0	685.00	-.179	225.0	693.00	-.258			
135.0	687.30	-.155	225.0	695.00	-.333			
135.0	693.00	-.249	225.0	700.00	-.286			
135.0	695.00	-.265	225.0	702.00	-.082			
135.0	700.00	-.146	225.0	706.00	-.047			
135.0	702.00	-.072						
135.0	706.00	-.043						

PHI	X	CP	PHI	X	CP	PHI	X	CP
0.0	596.00	-100	157.5	693.00	-234	247.5	685.00	-213
0.0	620.00	-203	157.5	700.00	-391	252.5	685.00	-219
0.0	637.00	-242	180.0	590.15	-142	282.0	685.00	-283
0.0	665.00	-104	180.0	625.35	-127	292.5	685.00	-256
0.0	675.00	-181	180.0	661.60	-084	315.0	644.35	-102
0.0	685.00	-224	180.0	685.00	-179	315.0	658.00	-170
0.0	697.00	-241	180.0	687.30	-210	315.0	670.25	-137
0.0	693.00	-398	180.0	693.00	-230	315.0	685.00	-239
0.0	700.00	-146	181.0	694.00	-257	320.0	687.30	-263
0.0	706.00	-048	180.0	700.00	-340	315.0	693.00	-322
22.5	693.00	-367	180.0	706.00	-060	315.0	695.00	-369
22.5	700.00	-154	202.5	693.00	-225	315.0	700.00	-131
45.0	693.00	-350	215.0	685.00	-170	315.0	702.00	-060
45.0	700.00	-150	215.0	687.30	-221	315.0	706.00	-035
45.0	706.00	-092	225.0	520.00	-007	TCL	558.70	-237
50.0	685.00	-213	225.0	571.00	-050	TCL	685.00	-229
50.0	687.30	-287	225.0	611.00	-113	BCL	586.00	-170
77.0	685.00	-111	225.0	624.50	-060	BCL	646.00	-097
90.0	693.00	-080	225.0	643.00	-075	BCL	671.00	-060
90.0	706.00	-122	225.0	667.00	-129			
135.0	685.00	-189	225.0	693.00	-276			
135.0	687.30	-162	225.0	695.00	-352			
135.0	693.00	-258	225.0	700.00	-264			
135.0	695.00	-266	225.0	702.00	-074			
135.0	700.00	-145	225.0	706.00	-041			
135.0	702.00	-074						
135.0	706.00	-045						

AN CG = 1.92

W = 21192

DA L = 7.81

DH L = -1.87

DR L = -.96

DSB = -.29

AE L = 297

AE R = 314

PS 1 = 726.4

PS 2 = 723.8

H = 26786

DEL P = -.02

-6

TABLE 3.—Continued

PHI	X	CP	PHI	X	CP	PHI	X	CP
0.0	596.00	-0.115	157.5	693.00	-0.178	247.5	685.00	-0.233
0.0	620.00	-0.227	157.5	700.00	-0.266	252.5	685.00	-0.251
0.0	637.00	-0.267	180.0	590.15	0.000	282.0	685.00	-0.288
0.0	665.00	-0.089	180.0	625.35	-0.110	292.5	685.00	-0.247
0.0	675.00	-0.182	180.0	661.60	-0.103	315.0	644.35	-0.101
0.0	685.00	-0.209	180.0	685.00	-0.184	315.0	658.00	-0.162
0.0	687.00	-0.220	180.0	687.30	-0.227	315.0	670.25	-0.134
0.0	693.00	-0.310	180.0	693.00	-0.192	315.0	685.00	-0.163
0.0	700.00	-0.070	181.0	594.00	-0.224	320.0	687.30	-0.253
0.0	706.00	-0.019	180.0	700.00	-0.219	315.0	693.00	-0.249
22.5	693.00	-0.292	202.5	693.00	0.011	315.0	695.00	-0.206
45.0	693.00	-0.212	215.0	685.00	-0.181	315.0	700.00	-0.049
45.0	700.00	-0.079	215.0	687.30	-0.223	315.0	702.00	0.008
50.0	685.00	-0.185	225.0	520.00	0.033	TCL	706.00	-0.025
50.0	697.30	-0.245	225.0	571.00	-0.052	TCL	658.70	-0.120
77.0	685.00	-0.045	225.0	611.00	-0.087	BCL	685.00	-0.256
90.0	693.00	-0.022	225.0	624.50	-0.060	BCL	586.00	0.008
135.0	706.00	-0.060	225.0	667.00	-0.068	BCL	646.00	-0.110
135.0	695.00	-0.158	225.0	693.00	-0.134		671.00	-0.062
135.0	687.30	-0.127	225.0	695.00	-0.264			
135.0	693.00	-0.152	225.0	700.00	-0.352			
135.0	695.00	-0.159	225.0	702.00	-0.085			
135.0	700.00	-0.082	225.0	706.00	-0.015			
135.0	702.00	-0.020			0.007			
135.0	706.00	0.012						

TABLE 3. -Continued

M = 1.183	AN CG = 2.06	AE L = 308			
Q = 364.2	M = 22996	AE R = 313			
ALPHA = 3.92	DA L = .62	PS 1 = 371.9			
BETA = -.42	DH L = -5.19	PS 2 = 368.6			
NPR = 7.42	DR L = -.39	M = 41091			
-6	OSB = -.29	DEL P = -.02			
RN (10) = 2.12					
PHI	X	CP	PHI	X	CP
0.0	596.00	-.147	247.5	685.00	-.247
0.0	620.00	-.251	252.5	685.00	-.268
0.0	637.00	-.302	282.0	685.00	-.295
0.0	665.00	-.043	292.5	685.00	-.261
0.0	675.00	-.198	315.0	644.35	-.107
0.0	685.00	-.211	315.0	658.00	-.178
0.0	687.00	-.218	315.0	670.25	-.126
0.0	693.00	-.247	315.0	685.00	-.225
0.0	700.00	-.070	320.0	687.30	-.262
0.0	705.00	-.040	315.0	693.00	-.269
22.5	693.00	-.319	315.0	695.00	-.166
22.5	700.00	-.040	315.0	700.00	-.046
45.0	693.00	-.187	315.0	702.00	-.014
45.0	700.00	-.075	315.0	706.00	-.001
45.0	705.00	-.032	TCL	658.70	-.115
50.0	685.00	-.181	TCL	685.00	-.190
50.0	687.30	-.244	BCL	586.00	-.090
77.0	685.00	-.043	BCL	646.00	-.136
90.0	693.00	-.024	BCL	671.00	-.063
90.0	705.00	-.070			
135.0	685.00	-.160			
135.0	687.30	-.142			
135.0	693.00	-.167			
135.0	695.00	-.151			
135.0	700.00	-.082			
135.0	702.00	-.035			
135.0	705.00	-.009			

TABLE 3.—Continued

M = .621	AN CG = 4.12	AE L = 207			
Q = 423.2	W = 20049	AE R = 211			
ALPHA = 5.58	DA L = 1.36	PS 1 = 1581.4			
BETA = -.55	DH L = -1.98	PS 2 = 1582.0			
NPR = 2.86	OR L = .17	M = 8060			
-6	DSB = -.46	DEL P = -.07			
RN (10) = 3.37					
PHI	X	CP	PHI	X	CP
0.0	596.00	-.234	247.5	685.00	-.153
0.0	620.00	-.176	252.5	685.00	-.142
0.0	637.00	-.111	282.0	685.00	-.146
0.0	665.00	-.047	292.5	685.00	-.108
0.0	675.00	-.179	315.0	644.35	-.055
0.0	685.00	-.180	315.0	658.00	-.096
0.0	687.00	-.182	315.0	670.25	-.097
0.0	693.00	-.196	315.0	685.00	-.129
0.0	700.00	.006	320.0	687.30	-.147
0.0	706.00	.114	315.0	693.00	-.103
22.5	693.00	-.159	315.0	695.00	-.040
22.5	700.00	.012	315.0	700.00	-.035
45.0	693.00	-.056	315.0	702.00	-.101
45.0	700.00	.012	315.0	706.00	-.128
45.0	706.00	.023	TCL	658.70	-.045
50.0	685.00	-.147	TCL	685.00	-.106
50.0	687.30	-.174	TCL	586.00	-.063
77.0	685.00	.029	BCL	646.00	-.083
90.0	693.00	.047	BCL	671.00	-.060
90.0	706.00	.005			
135.0	685.00	-.110			
135.0	687.30	-.103			
135.0	693.00	-.059			
135.0	695.00	.002			
135.0	700.00	.029			
135.0	702.00	.043			
135.0	706.00	.058			

TABLE 3.—Continued

M = .920	AN CG = 4.13	AE L = 235			
Q = 844.0	M = 21047	AE R = 244			
ALPHA = 2.10	OA L = .43	PS 1 = 1454.0			
BETA = -2.51	OH L = -3.06	PS 2 = 1454.0			
NPR = 4.10	OR L = -2.79	M = 10547			
RN (10 ⁻⁶) = 4.92	OSB = -3.17	DEL P = -.16			
PHI	X	CP	PHI	X	CP
0.0	596.00	-.303	157.5	693.00	-.044
0.0	620.00	-.309	157.5	700.00	.036
0.0	637.00	-.084	180.0	590.15	-.065
0.0	665.00	-.023	180.0	625.35	-.072
0.0	675.00	-.167	180.0	661.60	-.087
0.0	685.00	-.179	180.0	685.00	-.137
0.0	687.00	-.158	180.0	687.30	-.121
0.0	693.00	-.171	180.0	693.00	-.093
0.0	700.00	.046	181.0	694.00	-.071
0.0	706.00	.149	180.0	700.00	.032
22.5	693.00	-.121	180.0	706.00	.125
22.5	700.00	.057	202.5	693.00	-.141
45.0	693.00	-.013	215.0	685.00	-.172
45.0	700.00	.044	215.0	687.30	-.174
45.0	706.00	.041	225.0	520.00	-.081
50.0	685.00	-.122	225.0	571.00	-.030
50.0	687.30	-.154	225.0	611.00	-.028
77.0	685.00	.063	225.0	624.50	-.093
90.0	693.00	.082	225.0	643.00	-.146
90.0	706.00	.032	225.0	667.00	-.119
135.0	685.00	-.011	225.0	693.00	-.142
135.0	687.30	.002	225.0	695.00	-.045
135.0	693.00	.061	225.0	700.00	.051
135.0	695.00	.064	225.0	702.00	.123
135.0	700.00	.059	225.0	706.00	.144
135.0	702.00	.050			
135.0	706.00	.040			
			247.5	605.00	-.172
			252.5	685.00	-.142
			282.0	685.00	-.122
			292.5	685.00	-.096
			315.0	644.35	-.036
			315.0	658.00	-.095
			315.0	670.25	-.103
			315.0	685.00	-.132
			320.0	687.30	-.141
			315.0	693.00	-.102
			315.0	695.00	-.035
			315.0	700.00	.040
			315.0	702.00	.122
			315.0	706.00	.158
			TCL	658.70	-.012
			TCL	685.00	-.061
			BCL	586.00	.039
			BCL	646.00	-.104
			BCL	671.00	-.050

TABLE 3.—Continued

PHI	X	CP	PHI	X	CP	PHI	X	CP
0.0	596.00	-.295	157.5	693.00	-.051	247.5	685.00	-.160
0.0	620.00	-.343	157.5	700.00	.032	252.5	685.00	-.135
0.0	637.00	-.097	180.0	590.15	-.052	282.0	685.00	-.113
0.0	665.00	-.018	180.0	625.35	-.059	292.5	685.00	-.091
0.0	675.00	-.152	180.0	661.60	-.075	315.0	644.35	-.020
0.0	685.00	-.166	180.0	685.00	-.138	315.0	658.00	-.073
0.0	687.00	-.154	180.0	687.30	.053	315.0	670.25	-.086
0.0	693.00	-.175	180.0	693.00	-.099	315.0	685.00	-.115
0.0	700.00	.039	181.0	694.00	-.070	320.0	687.30	-.125
0.0	705.00	.152	180.0	700.00	.036	315.0	693.00	-.081
22.5	693.00	-.114	180.0	706.00	.137	315.0	695.00	-.014
22.5	700.00	.051	202.5	693.00	-.128	315.0	700.00	.058
45.0	693.00	-.014	215.0	685.00	-.156	315.0	702.00	.131
45.0	700.00	.037	215.0	687.30	-.166	315.0	706.00	.157
45.0	685.00	.038	225.0	520.00	-.099	TCL	658.70	.010
50.0	685.00	-.113	225.0	571.00	-.036	TCL	685.00	-.058
50.0	687.30	-.139	225.0	611.00	-.002	BCL	586.00	-.075
77.0	685.00	.062	225.0	624.50	-.002	BCL	646.00	-.105
90.0	693.00	.077	225.0	643.00	-.115	BCL	671.00	-.039
90.0	706.00	.021	225.0	667.00	-.107			
135.0	685.00	-.009	225.0	693.00	-.132			
135.0	687.30	.000	225.0	695.00	-.039			
135.0	693.00	.044	225.0	700.00	.056			
135.0	695.00	.047	225.0	702.00	.132			
135.0	700.00	.044	225.0	706.00	.158			
135.0	702.00	.040						
135.0	705.00	.037						

TABLE 3.—Continued

M = .877	AN CG = 3.89	AE L = 224
Q = 418.2	W = 22113	AE R = 225
ALPHA = 4.52	DA L = 7.40	PS 1 = 791.0
BETA = -.78	DH L = -2.61	PS 2 = 789.2
NPR = 5.17	DR L = -.28	W = 25234
RN (10) = 2.96	DSB = -.23	DEL P = -.04

PHI	X	CP	PHI	X	CP
0.0	596.00	-.365	247.5	685.00	-.162
0.0	620.00	-.224	252.5	685.00	-.144
0.0	637.00	-.087	282.0	685.00	-.120
0.0	665.00	-.027	292.5	685.00	-.094
0.0	675.00	-.158	315.0	644.35	-.026
0.0	685.00	-.164	315.0	658.00	-.084
0.0	687.00	-.158	315.0	670.25	-.093
0.0	693.00	-.158	315.0	685.00	-.114
0.0	700.00	.053	320.0	687.30	-.121
0.0	706.00	.160	315.0	693.00	-.058
22.5	693.00	-.110	315.0	695.00	.010
22.5	700.00	.051	315.0	700.00	.081
45.0	693.00	-.014	315.0	702.00	.133
45.0	700.00	.034	315.0	706.00	.165
50.0	685.00	.042	TCL	658.70	.001
77.0	687.30	-.113	TCL	586.00	-.073
90.0	685.00	-.134	BCL	586.00	-.072
90.0	693.00	.050	BCL	646.00	-.102
135.0	706.00	.070	BCL	671.00	-.054
135.0	706.00	.027			
135.0	685.00	-.048			
135.0	687.30	-.035			
135.0	693.00	.026			
135.0	695.00	.045			
135.0	700.00	.042			
135.0	702.00	.044			
135.0	706.00	.050			

TABLE 3.—Concluded

M = 1.150	AN CG = 3.96	AE L = 334						
G = 801.1	M = 20791	AE R = 339						
ALPHA = 2.98	DA L = 1.39	PS 1 = 866.2						
BETA = -.57	DM L = -4.62	PS 2 = 866.5						
NPR = 5.78	DR L = -.91	H = 22757						
RN (10) = 4.20	DSB = -.28	DEL P = -.13						
PHI	X	CF	PHI	X	CP	PHI	X	CP
0.0	596.00	-.151	157.5	693.00	-.172	247.5	685.00	-.258
0.0	620.00	-.256	157.5	700.00	-.396	252.5	685.00	-.276
0.0	637.00	-.294	180.0	590.15	-.111	282.0	685.00	-.300
0.0	665.00	-.025	180.0	625.35	-.128	292.5	685.00	-.260
0.0	675.00	-.182	180.0	661.60	-.108	315.0	644.35	-.108
0.0	685.00	-.241	180.0	685.00	-.203	315.0	658.00	-.177
0.0	687.00	-.247	180.0	687.30	-.239	315.0	370.25	-.140
0.0	693.00	-.368	180.0	693.00	-.163	315.0	685.00	-.242
0.0	700.00	-.116	181.0	694.00	-.202	320.0	687.30	-.271
0.0	706.00	-.056	180.0	700.00	-.369	315.0	693.00	-.273
22.5	693.00	-.334	180.0	706.00	-.053	315.0	695.00	-.340
22.5	700.00	-.112	202.5	693.00	-.174	315.0	700.00	-.125
45.0	693.00	-.321	215.0	685.00	-.203	315.0	702.00	-.018
45.0	700.00	-.133	215.0	687.30	-.237	315.0	706.00	-.017
45.0	706.00	-.071	225.0	520.00	-.021	TCL	658.70	-.213
50.0	685.00	-.225	225.0	571.00	-.061	TCL	685.00	-.124
50.0	687.30	-.301	225.0	611.00	-.086	BCL	586.00	-.128
77.0	685.00	-.093	225.0	624.50	-.046	BCL	646.00	-.108
90.0	693.00	-.066	225.0	643.00	-.086	BCL	671.00	-.071
90.0	706.00	-.115	225.0	667.00	-.140			
135.0	685.00	-.200	225.0	693.00	-.240			
135.0	687.30	-.163	225.0	695.00	-.333			
135.0	693.00	-.192	225.0	700.00	-.381			
135.0	695.00	-.267	225.0	702.00	-.109			
135.0	700.00	-.209	225.0	706.00	-.055			
135.0	702.00	-.081						
135.0	706.00	-.034						

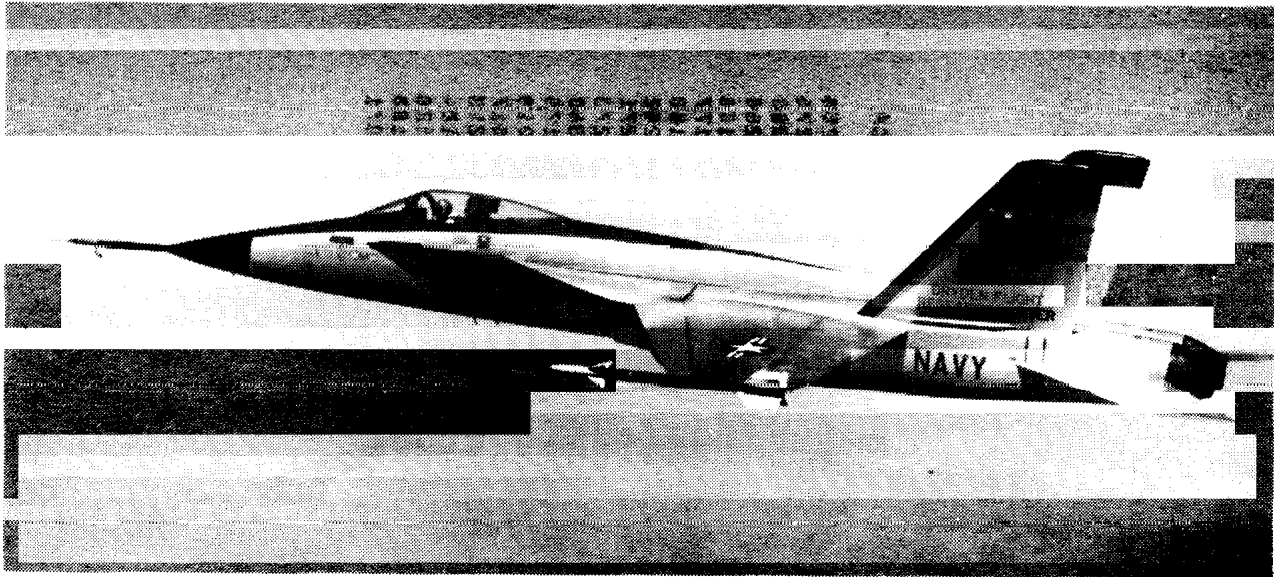


Figure 1. YF-17 aircraft.

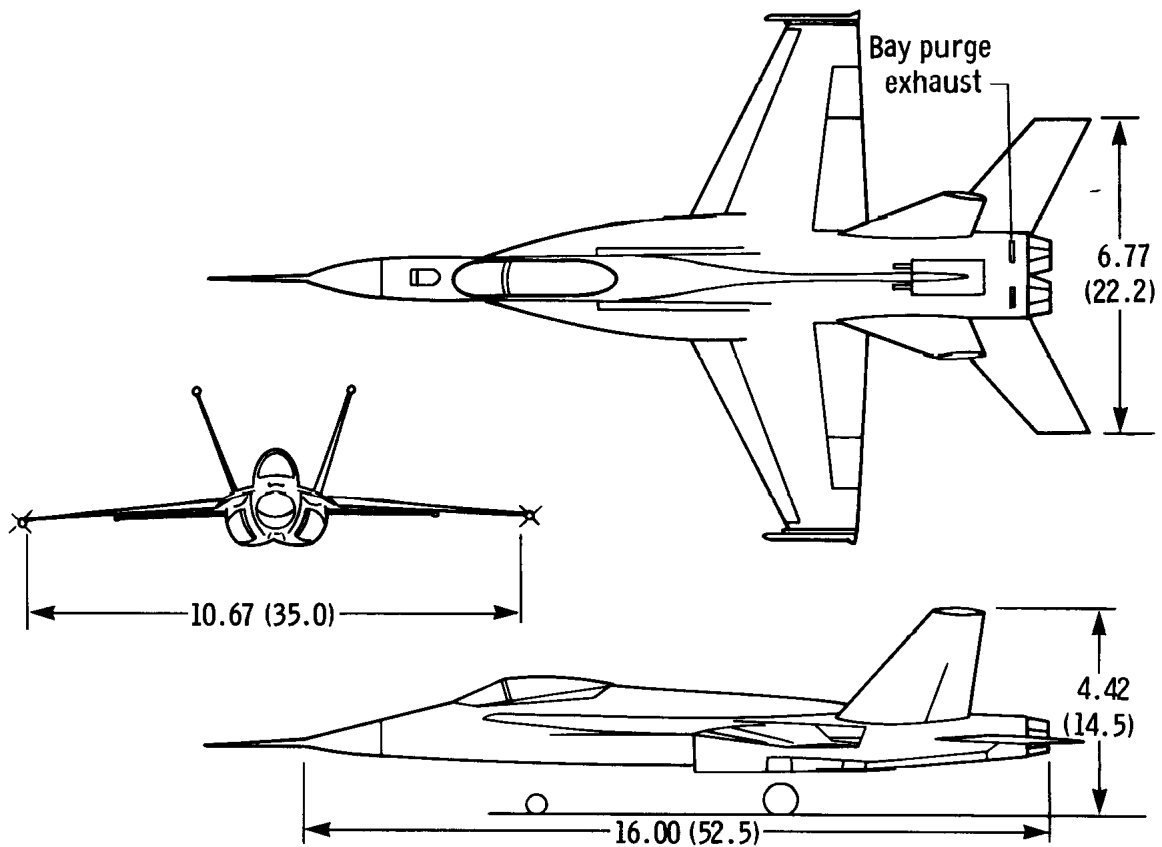


Figure 2. Three-view drawing of YF-17 airplane. Dimensions are in meters (feet).

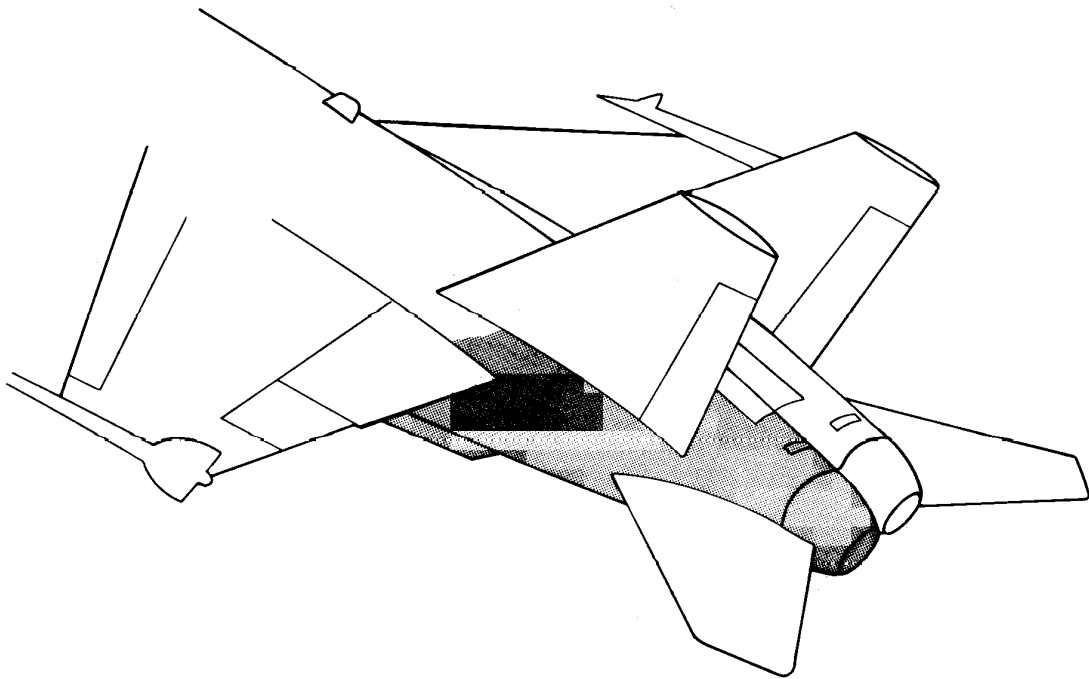
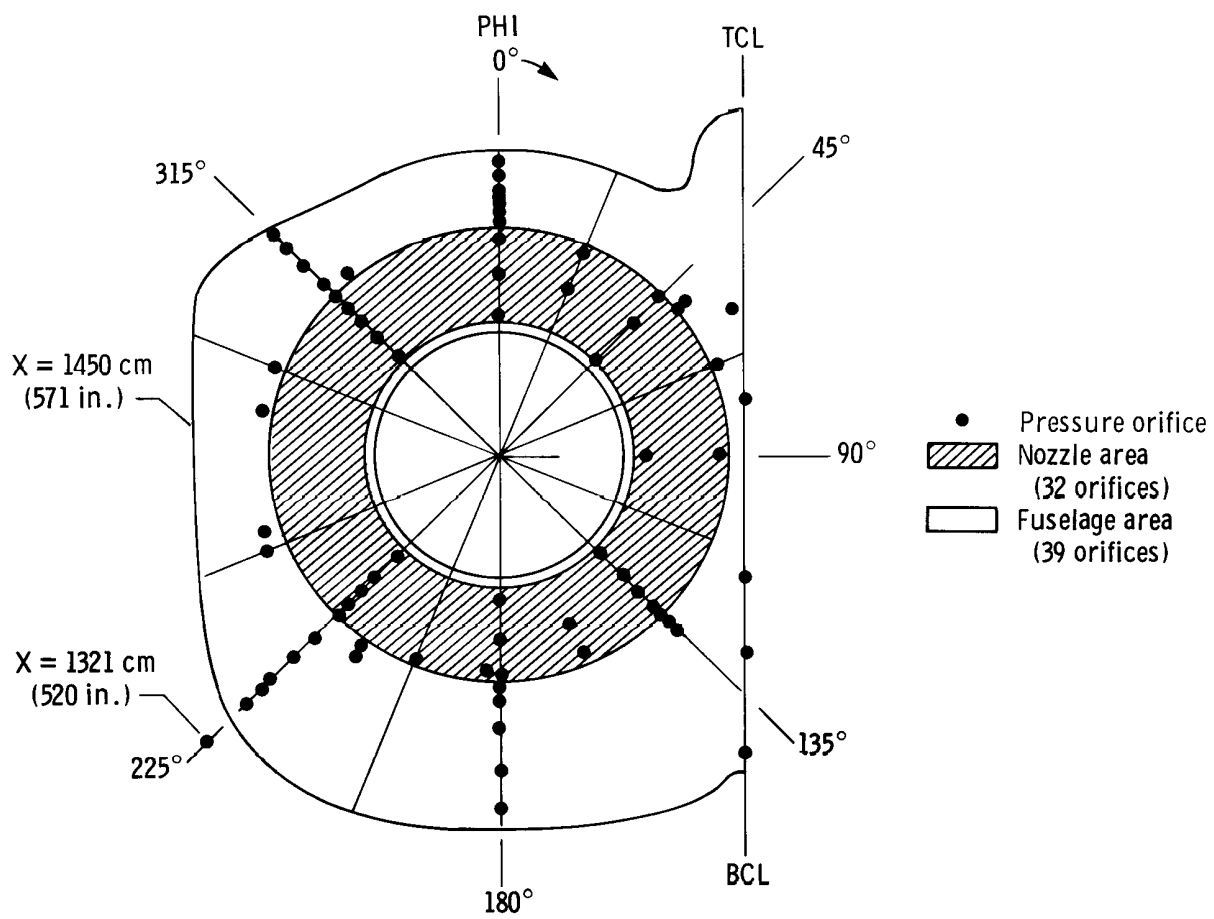
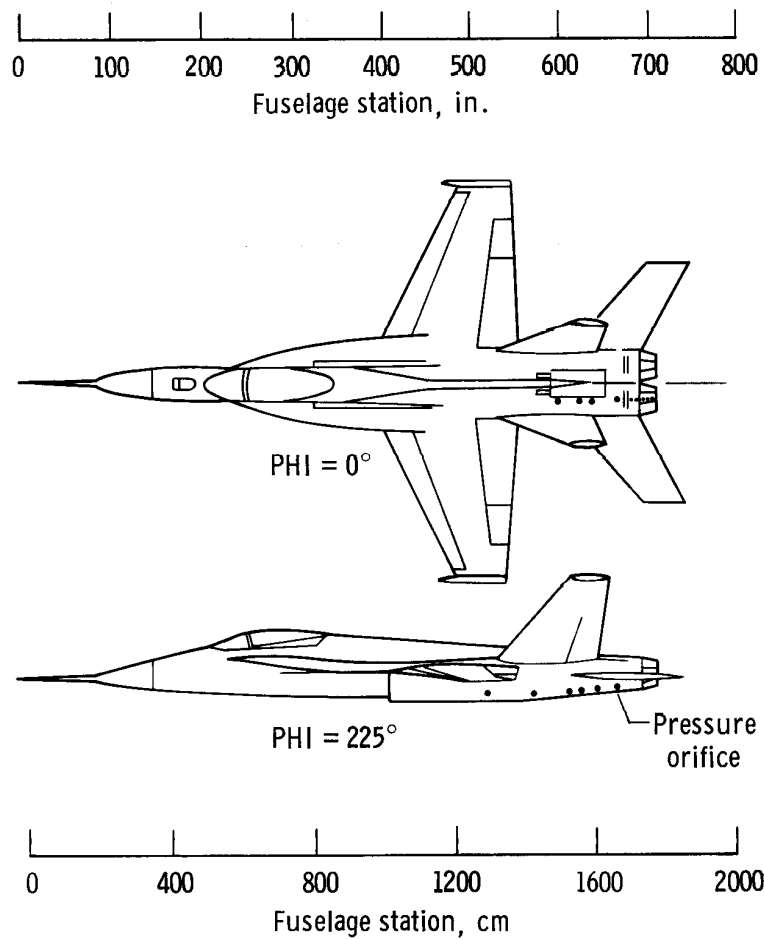


Figure 3. Rear view of instrumented region (shaded area) on left fuselage and nozzle.



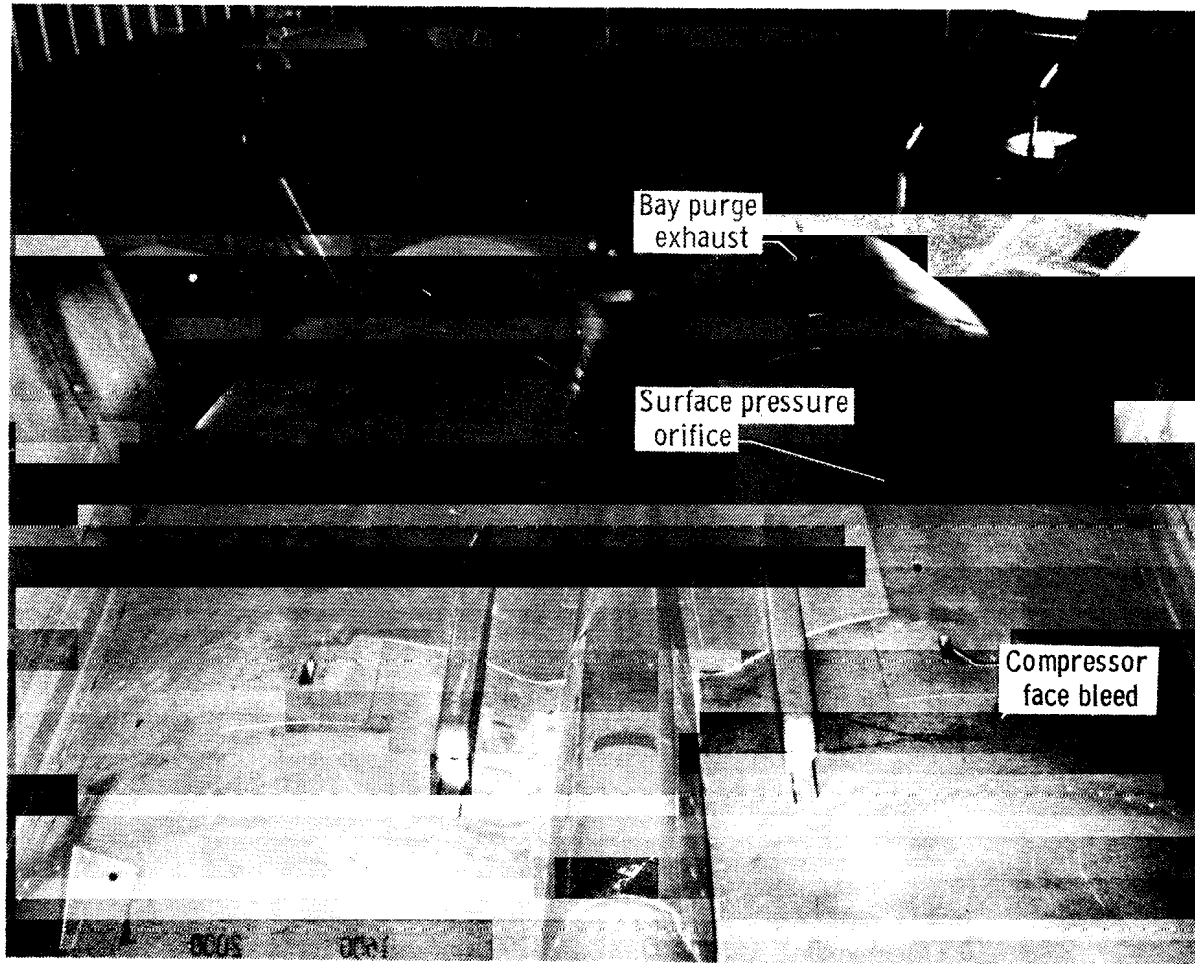
(a) Aft view looking forward.

Figure 4. Locations of flush pressure orifices.



(b) Orifice locations for $\text{PHI} = 0^\circ$ and 225° .
 $L = 1804.87 \text{ cm}$ (710.58 in.).

Figure 4. Concluded.



E 30543

Figure 5. Bay purge exhaust, compressor face bleed, and surface pressure orifices at $\text{PHI} = 0^\circ$.

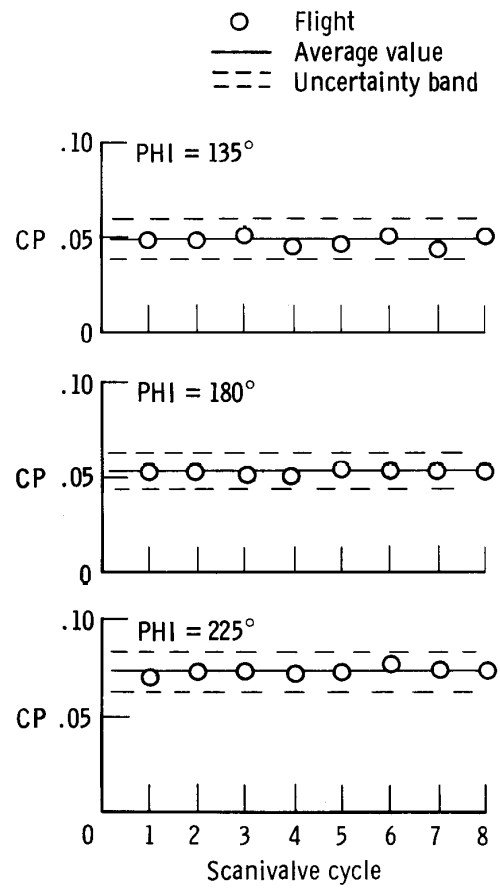
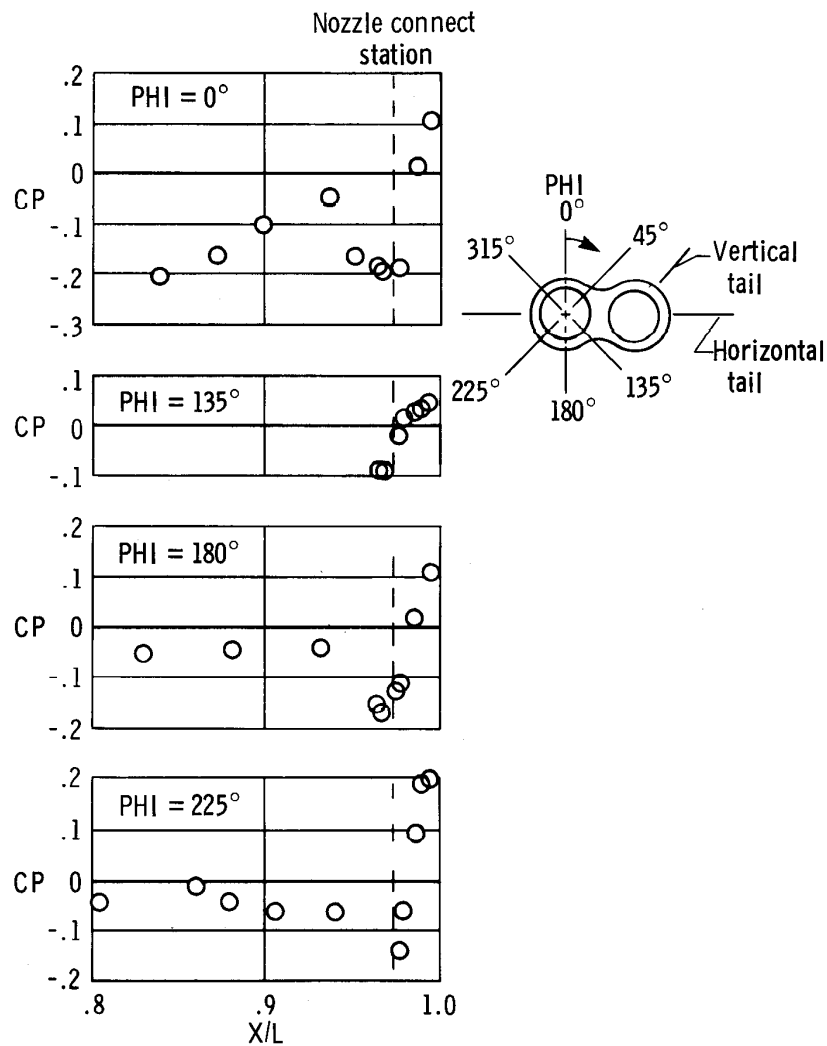
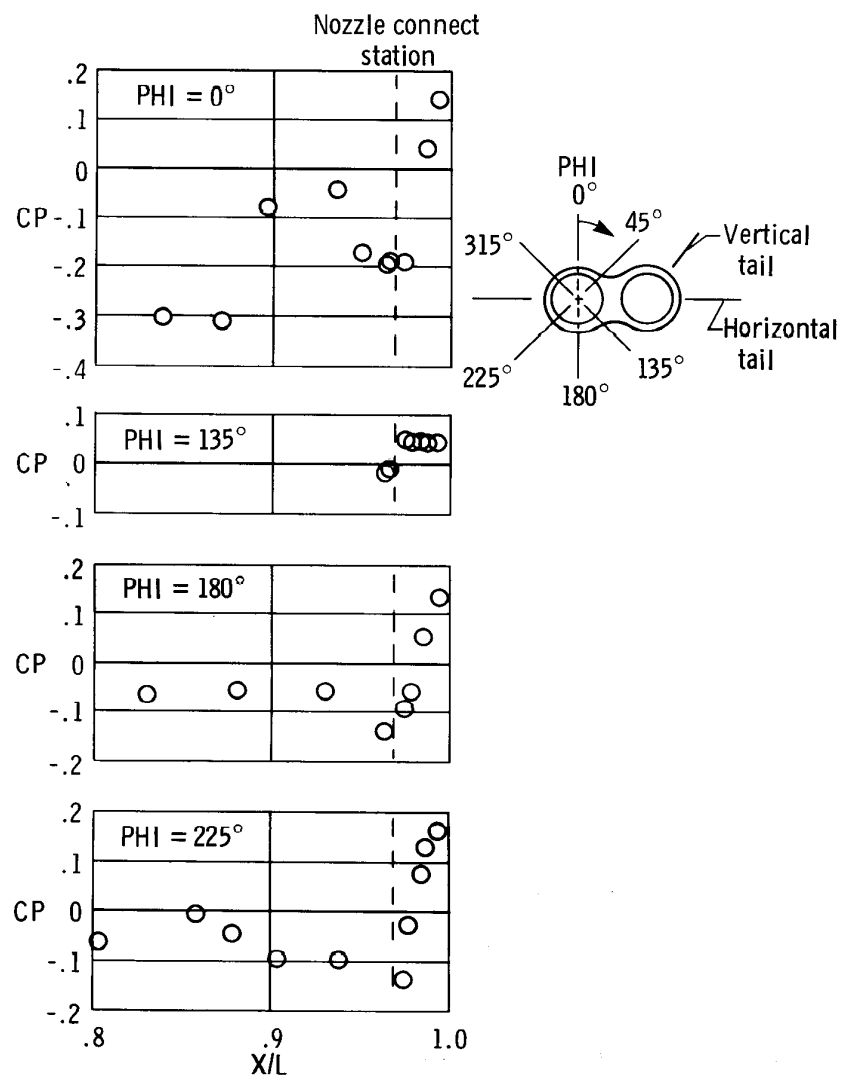


Figure 6. Typical stability of pressure at $X/L = 0.99$ for three circumferential locations.
 $M = 0.908$, $R = 2.25 \times 10^8$,
 $AN\ CG = 0.95g$.



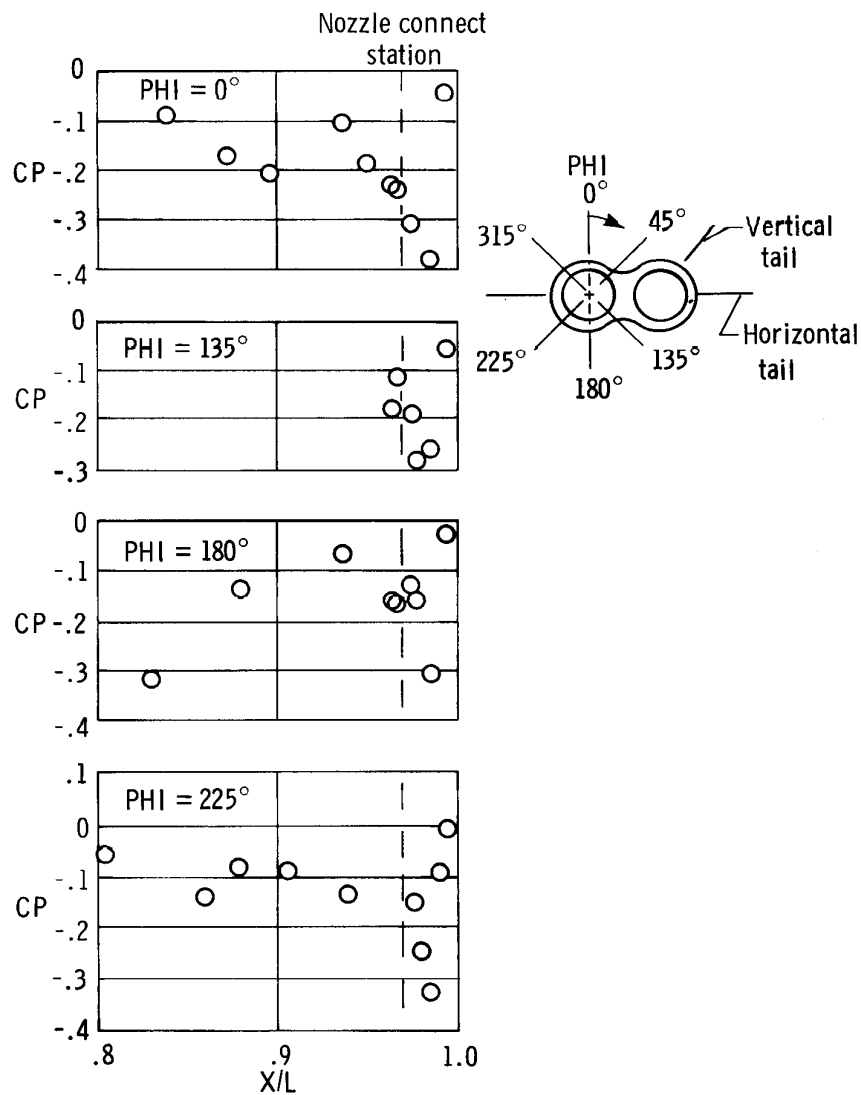
(a) $M = 0.610$, $\text{ALPHA} = 3.60^\circ$, $R = 1.22 \times 10^8$,
 $\text{NPR} = 1.84$, and $\text{DH } L = -1.10^\circ$.

Figure 7. Representative pressure coefficients for four radial locations.



(b) $M = 0.910$, $ALPHA = 0.90^\circ$, $R = 2.26 \times 10^8$,
 $NPR = 3.32$, and $DH L = -0.88^\circ$.

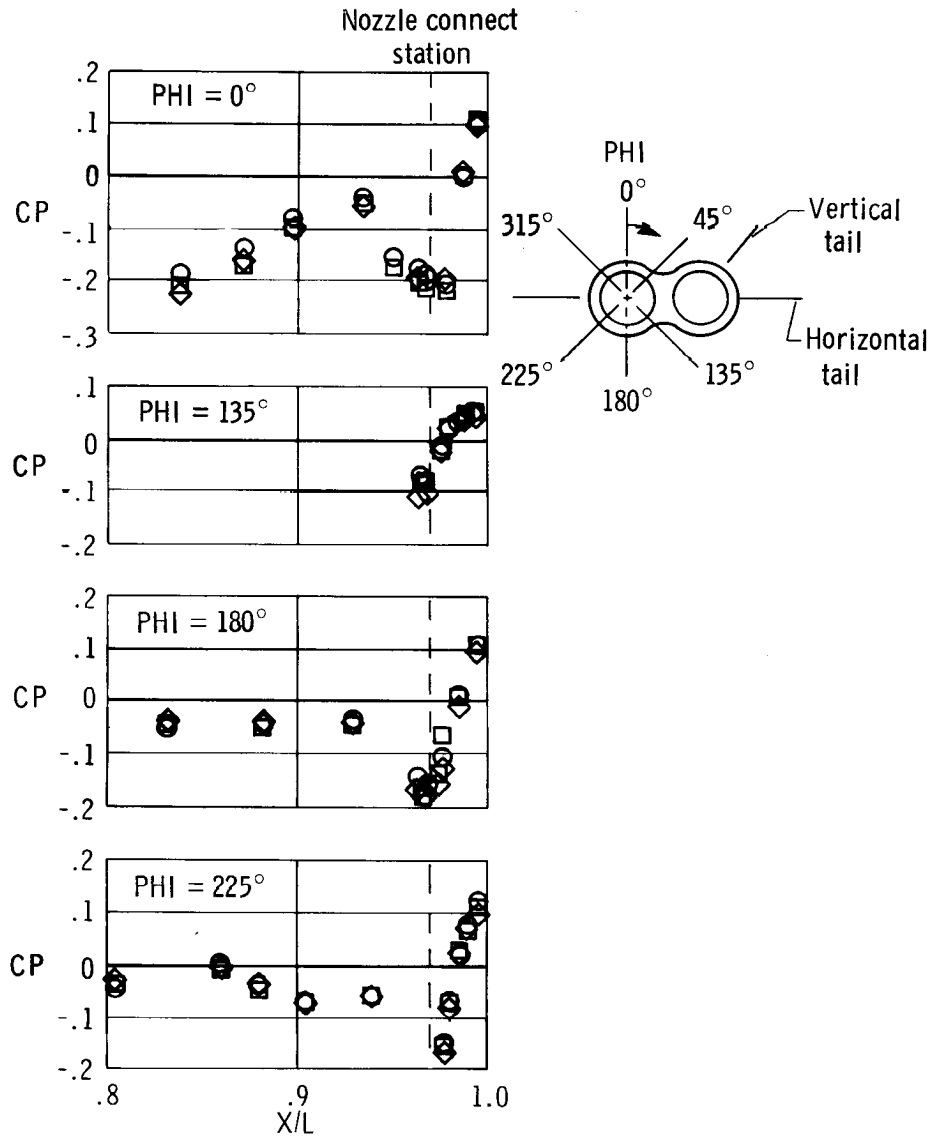
Figure 7. Continued.



(c) $M = 1.190$, $ALPHA = 0.70^\circ$, $R = 2.41 \times 10^8$,
 $NPR = 5.92$, and $DH L = 0.22^\circ$.

Figure 7. Concluded.

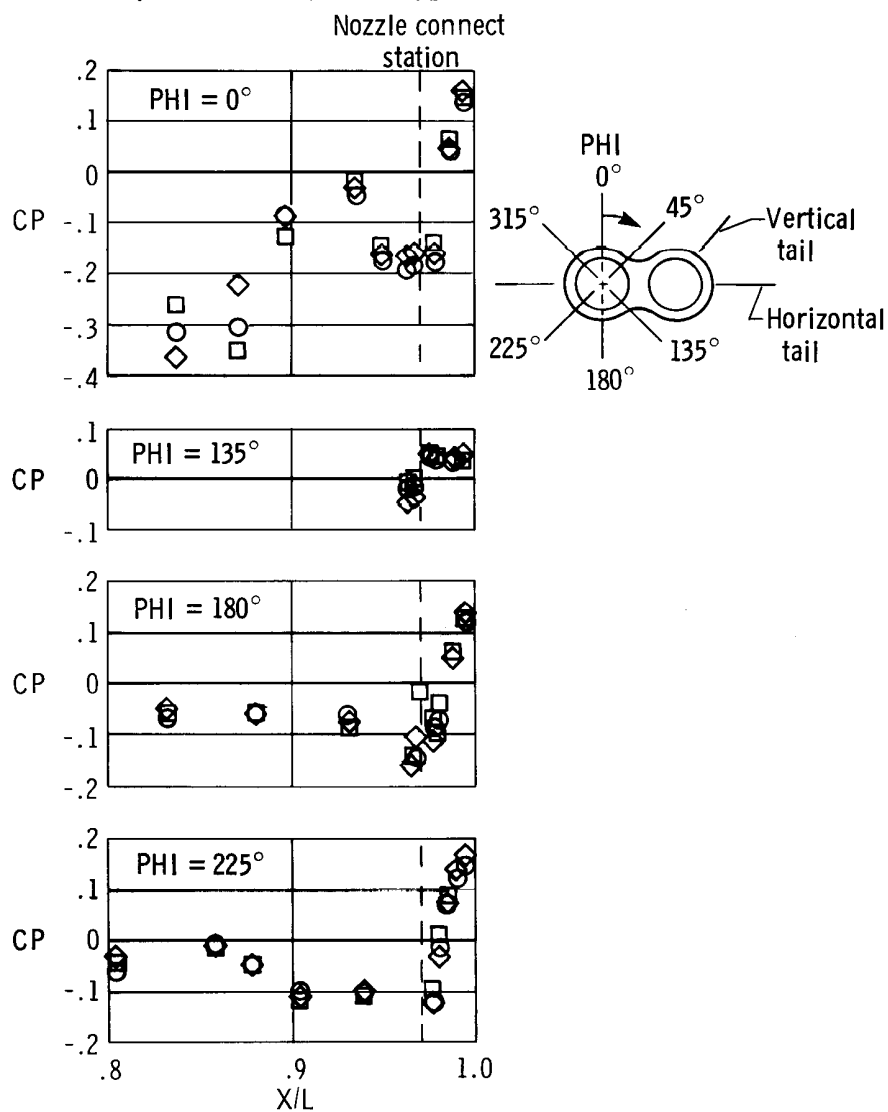
	M	ALPHA, deg	R	NPR	DH L, deg
○	0.610	2.10	2.11×10^8	1.98	-0.54
□	0.620	3.10	2.00	1.86	-1.09
◇	0.600	5.10	2.05	2.19	-2.01



(a) $M \approx 0.60$.

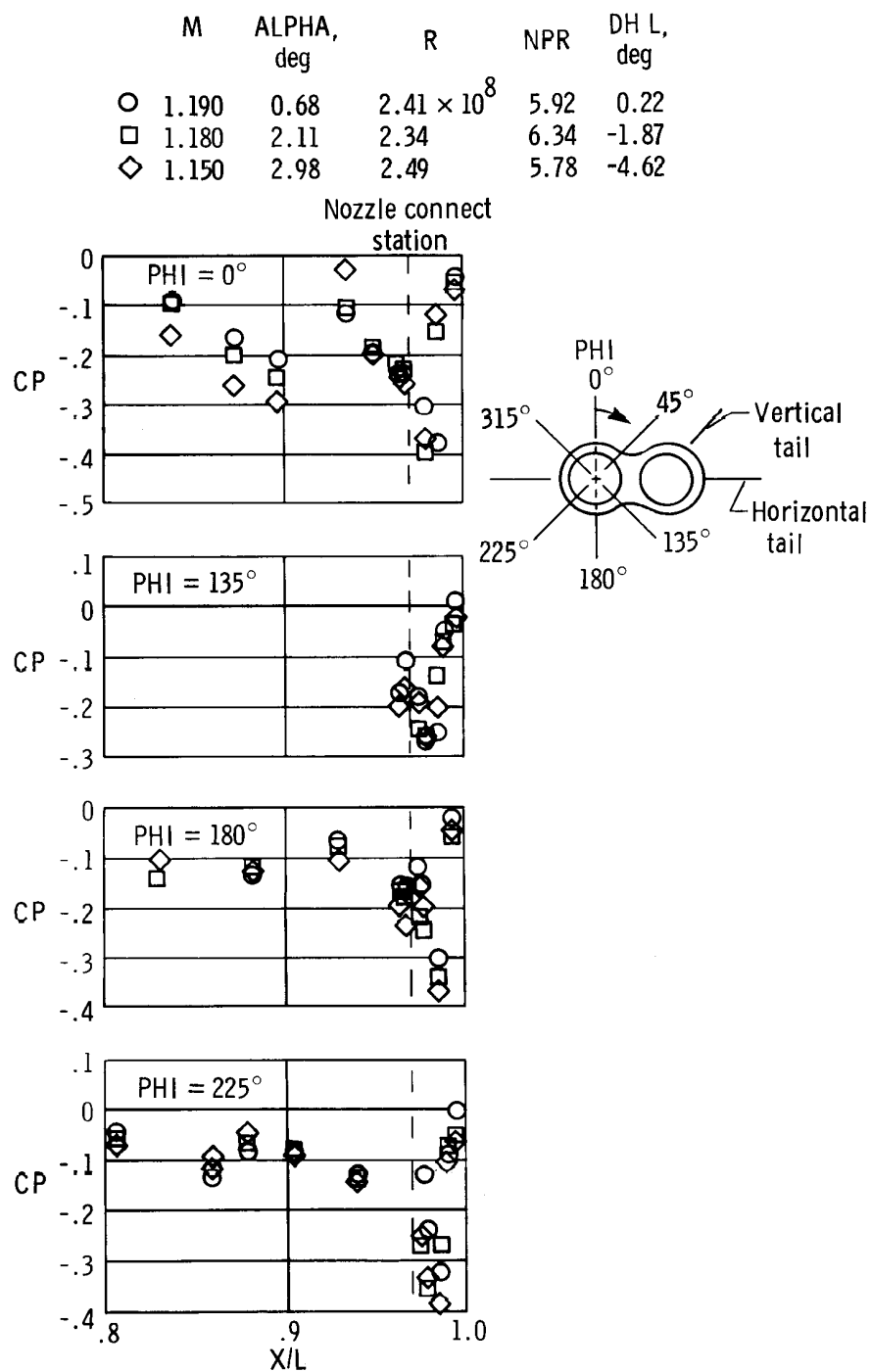
Figure 8. Effect of angle of attack on pressure coefficients for four radial locations.

	M	ALPHA, deg	R	NPR	DH L, deg
○	0.900	1.38	1.66×10^8	3.42	-0.88
□	0.930	2.44	2.44	4.28	-2.21
◇	0.880	4.52	4.52	5.17	-2.61



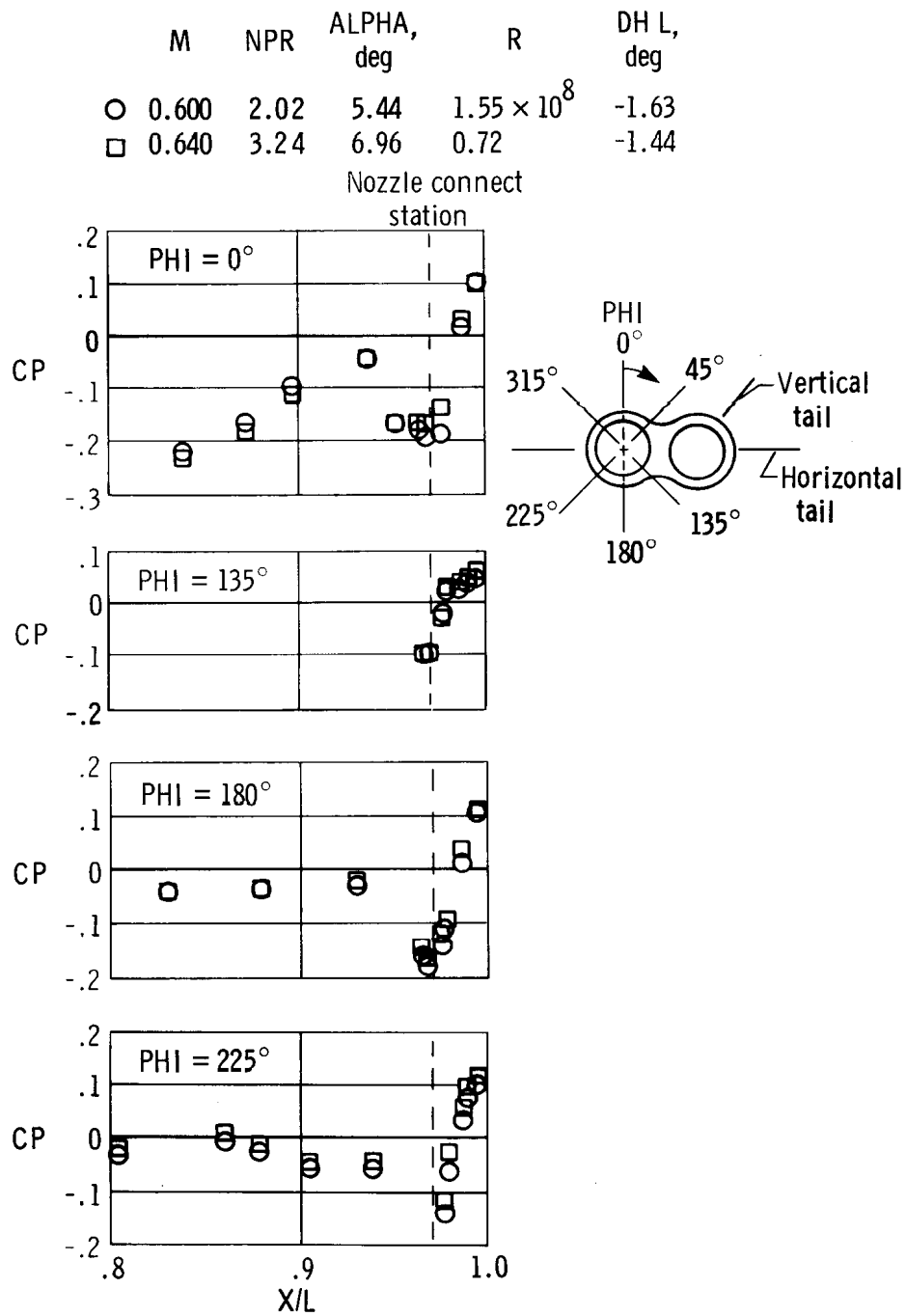
(b) $M \approx 0.90$.

Figure 8. Continued.



(c) $M \approx 1.2$.

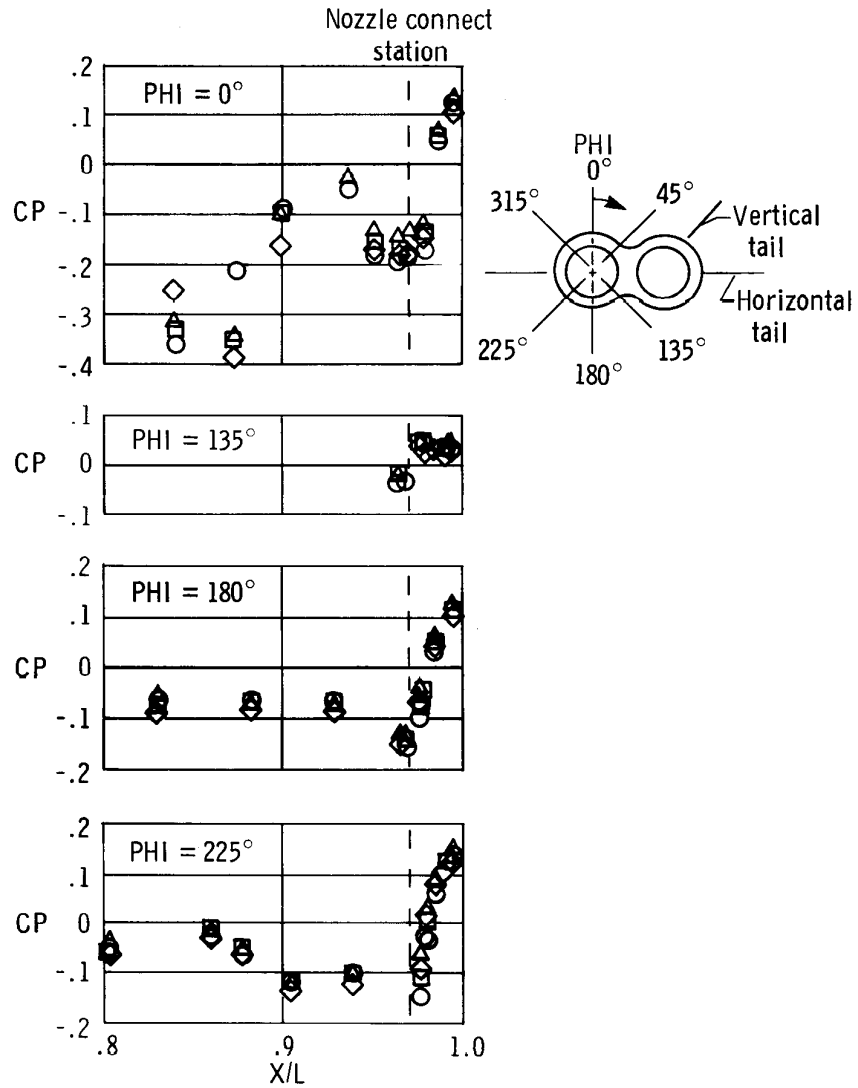
Figure 8. Concluded.



(a) $M \approx 0.60$, nonafterburning condition.

Figure 9. Effect of nozzle pressure ratio on pressure coefficients for four radial locations.

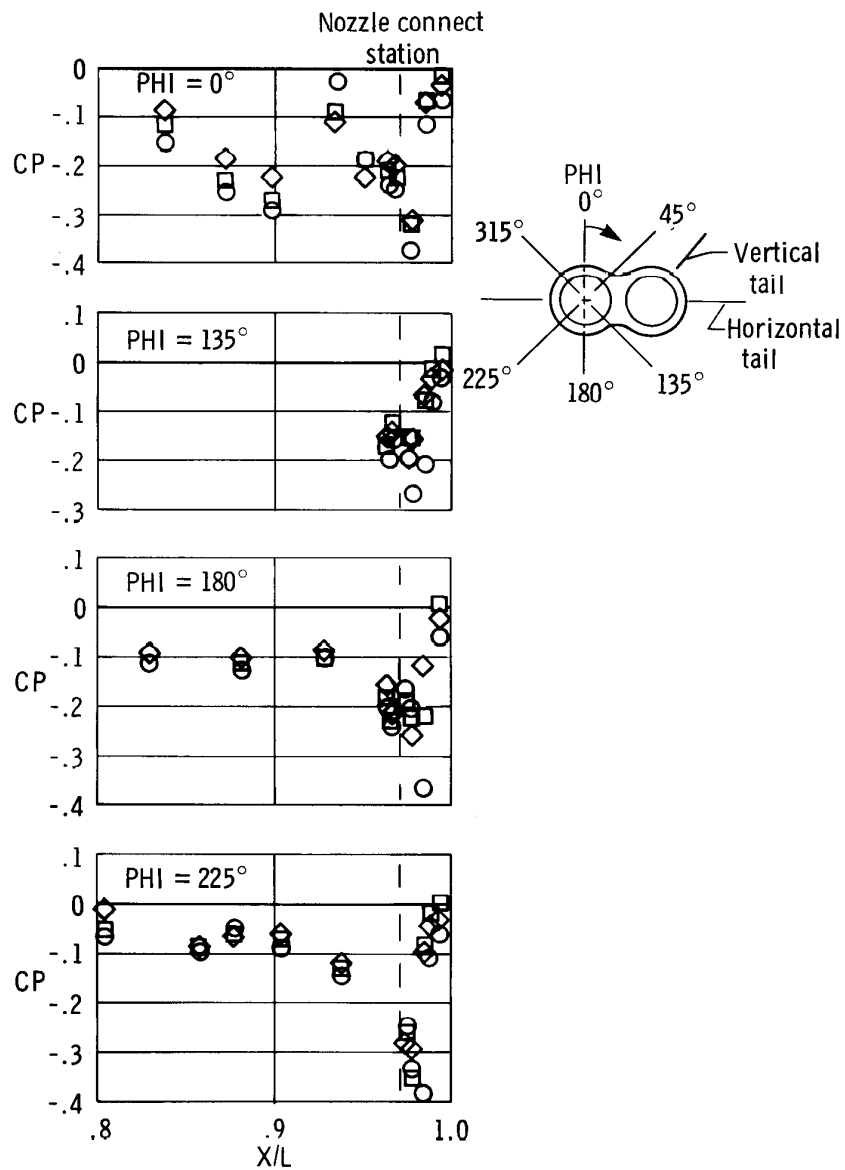
	M	NPR	ALPHA, deg	R	DH L, deg
○	0.880	3.37	2.57	1.59×10^8	-1.48
□	0.900	3.79	2.73	0.91	-1.34
◇	0.925	4.15	2.58	0.95	-1.75
△	0.910	5.67	3.55	0.60	-2.11



(b) $M = 0.90$, nonafterburning condition.

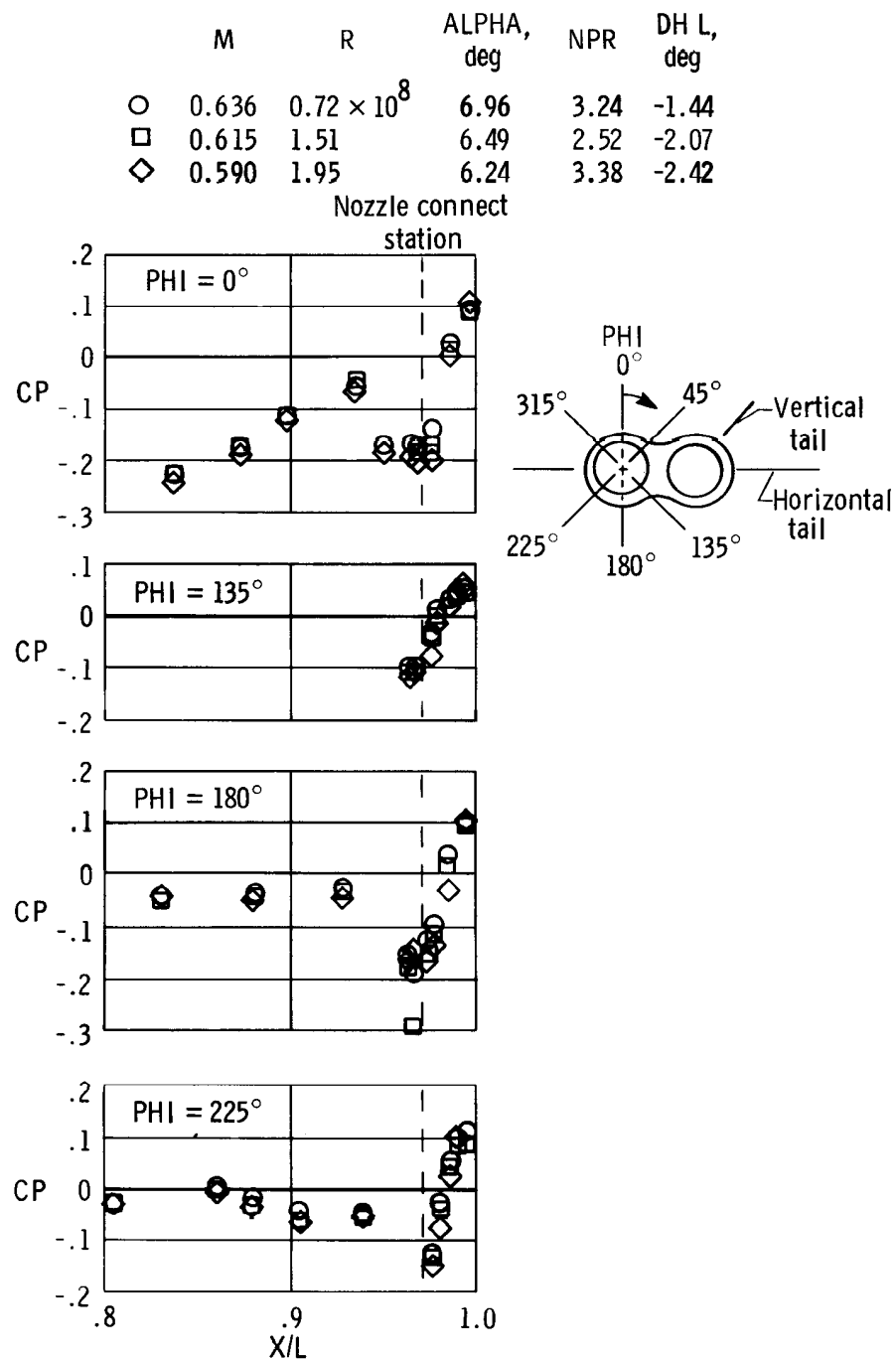
Figure 9. Continued.

	M	NPR	ALPHA, deg	R	DH L, deg
○	1.150	5.78	2.98	2.48×10^8	-4.62
□	1.190	7.36	3.00	1.33	-3.77
◇	1.250	8.08	2.85	0.92	-2.78



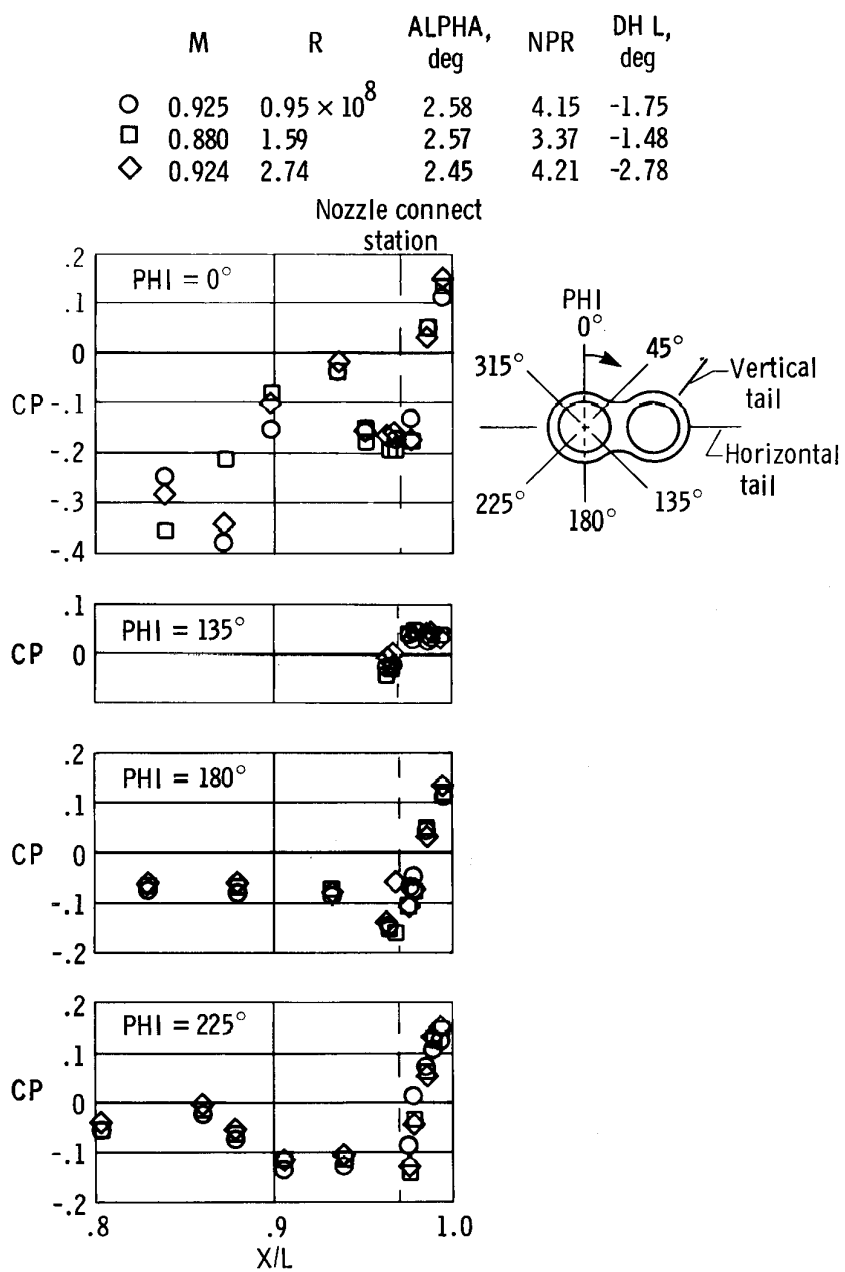
(c) $M = 1.20$, afterburning condition.

Figure 9. Concluded.



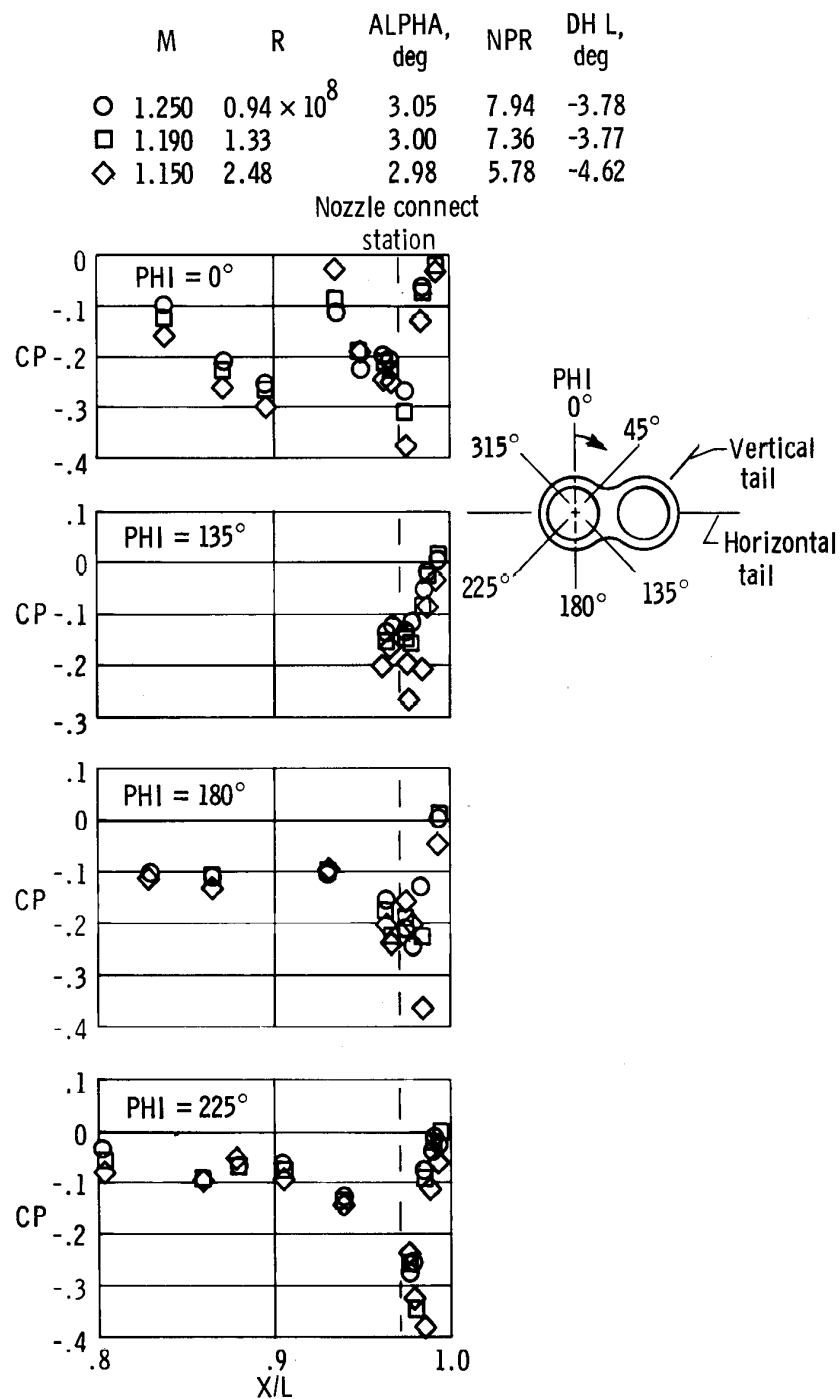
(a) $M \approx 0.60$.

Figure 10. Effect of Reynolds number on pressure coefficients for four radial locations.



(b) $M \approx 0.90$.

Figure 10. Continued.



(c) $M \approx 1.20$.

Figure 10. Concluded.

1. Report No. NASA TP-1549	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle FLIGHT-MEASURED AFTERBODY PRESSURE COEFFICIENTS FROM AN AIRPLANE HAVING TWIN SIDE-BY-SIDE JET ENGINES FOR MACH NUMBERS FROM 0.6 TO 1.6		5. Report Date November 1979	
		6. Performing Organization Code	
7. Author(s) Louis L. Steers		8. Performing Organization Report No. H-1066	
		10. Work Unit No. 505-06-54	
9. Performing Organization Name and Address NASA Dryden Flight Research Center P. O. Box 273 Edwards, California 93523		11. Contract or Grant No.	
		13. Type of Report and Period Covered Technical Paper	
12. Sponsoring Agency Name and Address National Aeronautics and Space Administration Washington, D. C. 20546		14. Sponsoring Agency Code	
15. Supplementary Notes			
16. Abstract <p style="text-align: center;">Afterbody pressure distribution data were obtained in flight from an airplane having twin side-by-side jet exhausts. The data were obtained in level flight at Mach numbers from 0.60 to 1.60 and at elevated load factors for Mach numbers of 0.60, 0.90, and 1.20. The test altitude varied from 2300 meters (7500 feet) to 15,200 meters (50,000 feet) over a speed range that provided a matrix of constant Mach number and constant unit Reynolds number test conditions.</p> <p style="text-align: center;">The results of the full-scale flight afterbody pressure distribution program are presented in this report in the form of plotted pressure distributions and tabulated pressure coefficients with Mach number, angle of attack, engine nozzle pressure ratio, and unit Reynolds number as controlled parameters. Wind-tunnel tests for 0.1-scale and 0.2-scale models of the full-scale aircraft have been completed but are reported separately.</p>			
17. Key Words (Suggested by Author(s)) Afterbody pressure Propulsion-airframe interaction YF-17 airplane		18. Distribution Statement Unclassified-Unlimited STAR Category: 02	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 89	22. Price* \$4.75

*For sale by the National Technical Information Service, Springfield, Virginia, 22161